# *Appendix A*
# *Additional Soil Arsenic Sampling*

## *APPENDIX A – ADDITIONAL SOIL ARSENIC SAMPLING*

Additional soil sampling activities were conducted in May and June 2006 to support remedial alternative evaluations for the Hookston Station Feasibility Study (FS). This appendix describes the field activities and presents the results of the soil sampling activities.

## *SCOPE OF WORK*

In May and June 2006, 17 soil samples for arsenic analysis were collected in the immediate vicinities of previous sampling locations B-69, B-84, and S-09. Surface soil samples previously collected at B-69 and B-84 reported arsenic concentrations of 211 and 75.8 milligrams per kilogram (mg/kg), respectively. Arsenic was not detected in surface soil at S-09 above a laboratory reporting level of 500 mg/kg. The purpose of the sampling activities was to confirm the absence or presence of elevated soil arsenic concentrations in each of these areas.

On 31 May 2006, soil samples were collected from eight soil borings, B-69A to B-69D and B-84A to B-84D. Borings B-69A and B-84A were advanced in the same locations as borings B-69 and B-84. Borings B-69B to B-69D were advanced within 10 feet of B-69A and borings B-84B to B-84D were located in a similar fashion around B-84A. On 7 June 2006, one soil sample was collected from boring S-09A, located in the same location as S-09. Sample locations are shown on Figure 2-6 of the FS.

Soil samples were collected in 6-inch brass liners with a manual slide hammer. Samples from B-69A/B/C/D and B-84A/B/C/D were collected from 0.5 and 2.0 feet below ground surface. Boring logs prepared for these locations are included in Attachment A. One soil sample was collected from S-09A at 0.5 feet below ground surface. Soil samples were submitted to Severn Trent Laboratories in Sacramento, California, for arsenic analysis by United States Environmental Protection Agency Method 6020.

## *ARSENIC SOIL SAMPLE RESULTS*

Arsenic was detected in each of the soil samples collected in May and June 2006, as described below:

- B-69 Area: surface soil samples reported arsenic concentrations from 0.56 to 23.4 mg/kg. Subsurface soil samples reported arsenic concentrations between 9.7 and 252 mg/kg.
- B-84 Area: arsenic was detected at concentrations up to 16.6 mg/kg in surface soils and 17.3 mg/kg in subsurface soils.
- S-09 Area: arsenic was detected in surface soil at a concentration of 4.2 mg/kg.

Figure A-1 and Table A-1 present the results, along with historical soil arsenic results. The laboratory analytical report is included in Attachment B. ERM conducted a data quality review of the soil results. As noted in that review, which is also included in Attachment B, no data required qualification or rejection.

The soil results were compared with the shallow soil Environmental Screening Level (ESL) for commercial/industrial land use (Regional Water Quality Control Board [RWQCB] 2005). As stated in the ESL document (RWQCB 2005), background arsenic concentrations in Bay Area soils often exceed health-based direct-contact goals for arsenic; therefore, the soil ESL of 5.5 mg/kg arsenic is based on an assumed background concentration of 5.5 mg/kg arsenic. Table A-2 provides a range of background metals values derived from nine publicly available studies performed on Bay Area sites, representing over 850 background soil samples. From these studies, a range of typical background values was generated, including an arsenic background range of 1.2 to 31 mg/kg. These values are considered representative of background conditions in East Bay soils and will be used as risk management thresholds for the FS rather than the arsenic soil ESL.

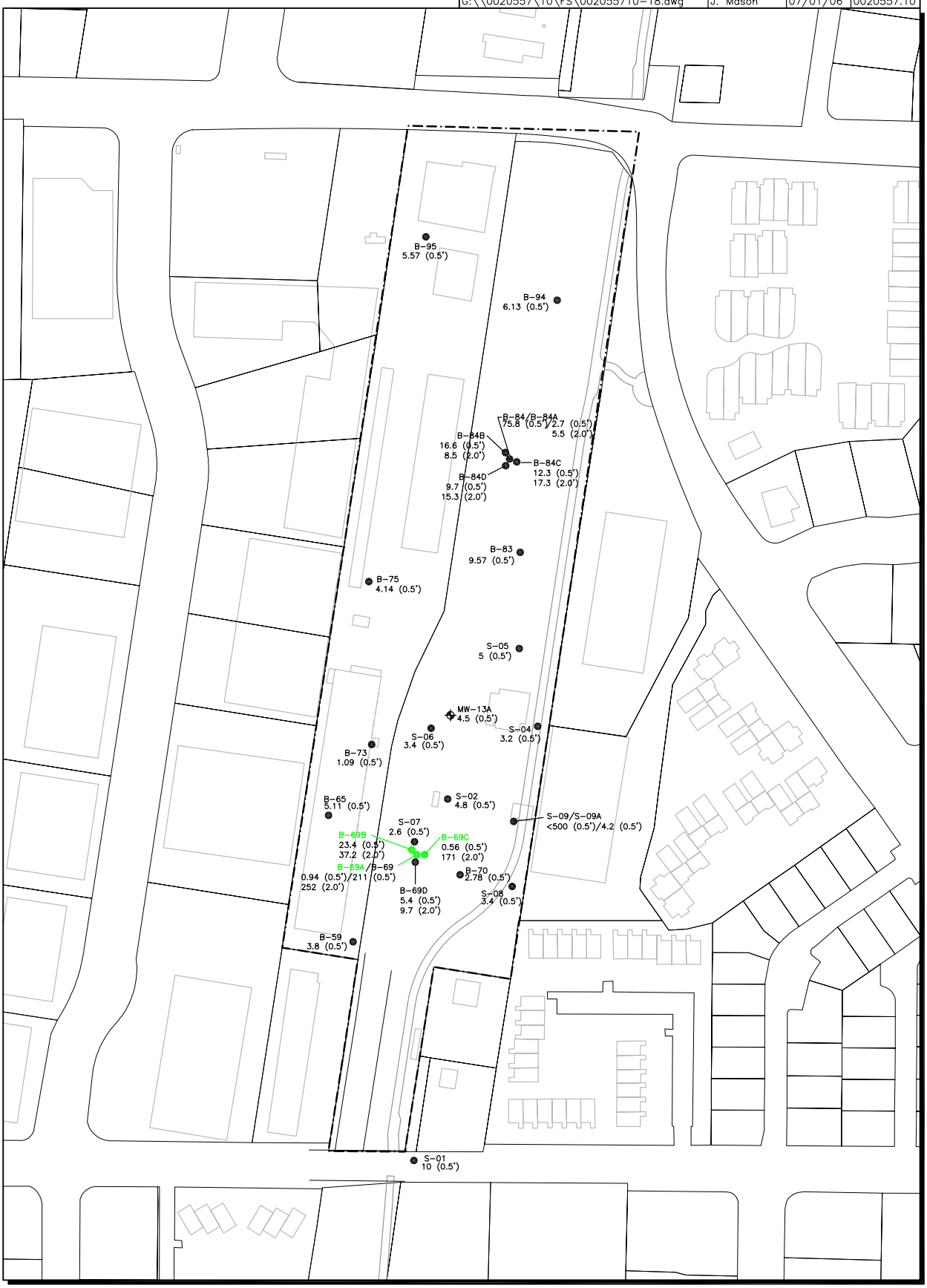
Based on the Bay Area soil background ranges, three of the four subsurface soil samples collected near B-69 contain soil arsenic concentrations above background levels.

## *REFERENCES*

Regional Water Quality Control Board. 2005. *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 1: Summary Tier 1 Lookup Tables.* Interim Final February 2005.

*Figure*

| CAD File: | Drawn By: | Date: | Project No. |
|---|---|---|---|
| G:\\0020557\10\FS\002055710-18.dwg | J. Mason | 07/01/06 | 0020557.10 |




LEGEND

- Monitoring Well Location
- Soil Boring Location
- Hookston Station Parcel Property Boundary
- One or More Sample Exceeds Background Levels for Arsenic in Bay Area Soils (31 mg/kg). B-69 and B-84 Based on May 2006 Sampling Results for B-69A/B/C/D and B-84A/B/C/D

10 (0.5') Arsenic Concentration in Soil (mg/Kg); Sample Depth (feet bgs)

< = Not Detected Above Reported Limit

N

0 120
FEET

Figure A-1
*Soil Arsenic Concentrations*
*Hookston Station*
*Pleasant Hill, California*

ERM 07/06

*Tables*

***Table A-1***
***Arsenic Detected in Soil Samples***
***Hookston Station***
***Pleasant Hill, California***

| Sample Location | Date | Sample Depth (feet) | Analytical Laboratory | Arsenic (mg/kg) | |
|---|---|---|---|---|---|
| | *RWQCB Commercial/Industrial (≤9.8 feet) ESL* | | | *5.5* | |
| | | | *CA Background*[1] | *1.2-31* | |
| S-01 | 10/27/1989 | 0.5 | MTA | 10 | |
| S-02 | 10/27/1989 | 0.5 | MTA | 4.8 | |
| S-04 | 10/27/1989 | 0.5 | MTA | 3.2 | |
| S-05 | 10/27/1989 | 0.5 | MTA | 5 | |
| S-06 | 10/27/1989 | 0.5 | MTA | 3.4 | |
| S-07 | 10/27/1989 | 0.5 | MTA | 2.6 | |
| S-08 | 10/27/1989 | 0.5 | MTA | 3.4 | |
| S-09 | 10/27/1989 | 0.5 | MTA | < 500 | u |
| S-09A | 6/7/2006 | 0.5 | STLSAC | 4.2 | |
| B-59 | 9/16/2003 | 0.5 | STLSEA | 3.8 | |
| B-65 | 10/1/2003 | 0.5 | STLSEA | 5.11 | |
| B-69 | 9/17/2003 | 0.5 | STLSEA | 211 | |
| B-69A | 5/11/2006 | 0.5 | STLSAC | 0.94 | |
| B-69A | 5/11/2006 | 2.0 | STLSAC | 252 | |
| B-69B | 5/11/2006 | 0.5 | STLSAC | 23.4 | |
| B-69B | 5/11/2006 | 2.0 | STLSAC | 37.2 | |
| B-69C | 5/11/2006 | 0.5 | STLSAC | 0.56 | |
| B-69C | 5/11/2006 | 2.0 | STLSAC | 171 | |
| B-69D | 5/11/2006 | 0.5 | STLSAC | 5.4 | |
| B-69D | 5/11/2006 | 2.0 | STLSAC | 9.7 | |
| B-70 | 9/17/2003 | 0.5 | STLSEA | 2.78 | |
| B-73 | 9/29/2003 | 0.5 | STLSEA | 1.09 | |
| B-75 | 9/22/2003 | 0.5 | STLSEA | 4.14 | |
| B-83 | 9/17/2003 | 0.5 | STLSEA | 9.57 | |
| B-84 | 9/23/2003 | 0.5 | STLSEA | 75.8 | |
| B-84A | 5/11/2006 | 0.5 | STLSAC | 2.7 | |
| B-84A | 5/11/2006 | 2.0 | STLSAC | 5.5 | |
| B-84B | 5/11/2006 | 0.5 | STLSAC | 16.6 | |
| B-84B | 5/11/2006 | 2.0 | STLSAC | 8.5 | |
| B-84C | 5/11/2006 | 0.5 | STLSAC | 12.3 | |
| B-84C | 5/11/2006 | 2.0 | STLSAC | 17.3 | |
| B-84D | 5/11/2006 | 0.5 | STLSAC | 9.7 | |
| B-84D | 5/11/2006 | 2.0 | STLSAC | 15.3 | |
| B-94 | 9/29/2003 | 0.5 | STLSEA | 6.13 | |
| B-95 | 9/29/2003 | 0.5 | STLSEA | 5.57 | |
| MW-13A | 9/30/2003 | 0.5 | STLSEA | 4.5 | |

**Notes:**
ESL = Environmental Screening Level
mg/kg = milligrams per kilogram
RWQCB = Regional Water Quality Control Board
u = Compound was analyzed for but not detected. Analyte result was below the Reporting Type Limit.
< = Not Detected
[1] = Refer to Table A-2 for additional information.

**Laboratories:**
MTA = MED-TOX Associates, Inc.
STLSEA = Severn Trent Laboratories, Seattle
STLSAC = Severn Trent Laboratories, Sacramento

*Table A-2*
*Comparison of Background Concentrations of Metals in Bay Area Soils*
*Hookston Station*
*Pleasant Hill, California*

| Study | Number of Samples | Formation | Calculation | Antimony | Arsenic | Barium | Bery-llium | Cadmium | Chromium | Cobalt | Copper | Lead | Mercury | Molyb-denum | Nickel | Selenium | Silver | Thallium | Vana-dium | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LBNL, 1995 | 498 | -- | 95% UCL | 5.5 | 19.1 | 323.6 | 1.0 | 2.7 | 99.6 | 22.2 | 69.4 | 16.1 | 0.4 | 7.4 | 119.8 | 5.6 | 1.8 | 27.1 | 74.3 | 106.1 |
| | 97 | Colluvium & Fill | 95% UCL | 5.9 | 14 | 358.8 | 0.9 | 1.5 | 91.4 | 22 | 59.6 | 14.5 | 0.3 | 3.2 | 120.2 | 5.6 | 1.7 | 42.5 | 78.2 | 91.5 |
| | 97 | Great Valley Group | 95% UCL | 6.3 | 31 | 248.5 | 1.0 | 3.2 | 59 | 25.5 | 99.7 | 21.5 | 0.6 | 3.8 | 69.7 | 4.8 | 2.2 | 8.7 | 69.3 | 135.9 |
| | 101 | Moraga Formation | 95% UCL | 6.1 | 9.3 | 154.1 | 0.8 | 2.6 | 142.2 | 23.1 | 54.1 | 8.9 | 0.3 | 3.8 | 100.4 | 4.7 | 2.0 | 38.9 | 90.1 | 84.7 |
| | 184 | Orinda Formation | 95% UCL | 5.2 | 17.8 | 411.2 | 1.1 | 3.3 | 95.2 | 20.6 | 66.9 | 14.8 | 0.3 | 11.4 | 144.3 | 7.0 | 1.9 | 19.8 | 69.3 | 98.3 |
| | 13 | San Pablo Group | 95% UCL | 7.1 | 15.7 | 280 | 0.8 | 2.9 | 78.6 | 22 | 40.9 | 10.3 | 0.4 | 3.7 | 125.9 | 4.9 | 1.5 | 10.9 | 36.2 | 97.7 |
| BMWC, 1994 | < 150 | Fill | Geometric mean | 1.98 | 4.32 | 40.6 | 0.29 | 0.43 | 16.32 | 6.45 | 5.44 | 4.79 | 0.07 | 0.76 | 42.85 | 1.36 | 0.35 | -- | 22.19 | 32.90 |
| | | Fill | Geometric std. dev. | 1.74 | 1.83 | 1.62 | 1.47 | 2.05 | 9.38 | 1.71 | 6.62 | 2.93 | 1.76 | 1.98 | 1.50 | 2.93 | 1.57 | -- | 1.54 | 1.54 |
| Scott, 1991 | ~150 | Alluvium | Arithmetic mean | -- | 2.86 | -- | 0.88 | -- | 51.28 | -- | 35.63 | 11.43 | -- | -- | 73.53 | -- | -- | -- | -- | 65.27 |
| | | | Std. dev. | -- | 2.61 | -- | 0.55 | -- | 20.77 | -- | 11.85 | 4.66 | -- | -- | 27.15 | -- | -- | -- | -- | 17.55 |
| MLH, 1991 | -- | Off-Site Background (2 Rounds) | Arithmetic mean | -- | 8.3 | -- | -- | 1.0 | 10.0 | -- | 22 | 32.4 | 0.14 | -- | 16 | -- | -- | -- | -- | 65 |
| | 23 | | | -- | < 4.1 | -- | -- | < 0.9 | 16.4 | -- | 7.2 | 61 | < 0.11 | -- | 18 | -- | -- | -- | -- | 67.2 |
| D&M, 1989a | 4 | Upgradient | Arithmetic mean | -- | 5.15 | 115 | -- | -- | 42.5 | 10 | 17.5 | 13.3 | 0.5 | -- | 42.5 | -- | -- | -- | 35 | 37.5 |
| D&M, 1989b | 26 | Upgradient | Arithmetic mean | -- | 1.9 | 127.3 | -- | -- | 44.6 | 11.5 | 17.7 | < 10 | 0.2 | -- | 45.4 | -- | -- | -- | 36.2 | 41.9 |
| SECD, 1992 | 5 | Clay / Loam | Arithmetic mean | 2.5 | 8.48 | 228 | 0.5 | 0.83 | 72.6 | 9.53 | 37 | 65 | 0.14 | 1.74 | 43 | < 0.25 | < 0.25 | < 0.25 | 46.9 | 281.6 |
| PRC, 1996 | 20 | Fill | 95% UCL | 1.5 | 8.4 | 145 | 0.72 | 0.27 | 95 | 16 | 72 | 59 | 0.6 | 0.33 | 96 | -- | 0.2 | -- | 70 | 152 |
| Author Unknown | 10 | Background Soil | Arithmetic mean | -- | 1.2 | 125 | 0.35 | -- | 33.4 | 8.8 | 22.7 | 7.4 | -- | -- | 22.5 | -- | -- | -- | 27.8 | 39.9 |
| | | | Std. dev. | -- | 1.8 | 145 | 0.17 | -- | 6.5 | 3.1 | 16.7 | 2.1 | -- | -- | 15.7 | -- | -- | -- | 6.3 | 16.4 |
| | | **Background Concentration Ranges** | | **1.5 - 7.1** | **1.2 - 31** | **41 - 411** | **0.29 - 1.1** | **0.27 - 3.3** | **10 - 142** | **6.5 - 25.5** | **5.4 - 100** | **4.8 - 65** | **0.07 - 0.6** | **0.33 - 11.4** | **16 - 144** | **<0.25 - 7** | **0.2 - 2.2** | **<0.25 - 42.5** | **22 - 90** | **33 - 282** |

**References:**


Author Unknown. *Results of Chemical Testing on Background Soil Samples, Area 2 Investigation Completion Report, Roberts Landing Development Site, San Leandro, California.* 1994

BMWC = Burns and McDonnell Waste Consultants, Inc. *San Francisco International Airport Background Metals Concentrations in Soil.* December 1994.

D&M = Dames and Moore, Inc. *Report - Phase II Remedial Investigation, 1455 Factor Avenue Site, San Leandro, California.* 3 August 1989.

D&M = Dames and Moore, Inc. *Report - Phase II Remedial Investigation, 750 139th Avenue Site, San Leandro, California.* 13 October 1989.

LBNL = Lawrence Berkeley National Laboratory, University of California, Environmental Restoration Program. *Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory.* August 1995.

MLH = McLaren-Hart. *Remedial Investigation Report - Hercules Properties, Inc., Hercules, California.* 15 March 1991.

PRC = PRC Environmental Management. *Final Remedial Investigation Report - Fleet and Industrial Supply Center Oakland, Alameda Facility / Alameda Annex Site, Alameda California.* January 1996.

Scott = Scott, Christina Marie. *Background Metals Concentrations in Northern Santa Clara County, California. Master's Thesis, University of San Francisco.* December 1991.

SECD = SEC Donahue Environment and Infrastructure. *Sitewide Remedial Investigation, Pacific States Steel Corporation, Union City, California.* 3 December 1992.


UCL = Upper confidence level

*Attachment A*
*Soil Boring Logs*

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: DirectPush
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 0 | | SP | | B-69A-0.5 | | SAND (SP): tan, gravelly, dry. |
| 1 | | | | | | SAND (SP): as above. |
| | | | | B-69A-2.0 | | SAND (SP): as above, less gravel, silty. |
| 2 | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: DirectPush
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 0 | | SP | | B-69B-0.5 | | SAND (SP): tan, gravelly, dry. |
| 1 | | | | | | SAND (SP): as above. |
| | | ML | | B-69B-2.0 | | SILT (ML): dark gray, clayey, stiff, dry. |
| 2 | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: DirectPush
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 1 | | SP | | B-69C-0.5 | | SAND (SP): tan, gravelly, dry. |
| | | | | | | SAND (SP): as above, brown. |
| 2 | | ML | | B-69C-2.0 | | SILT (ML): dark gray, clayey, stiff, dry. |
| | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: DirectPush
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 0 | | SP | | B-69D-0.5 | | SAND (SP): tan, gravelly, dry. |
| 1 | | | | | | SAND (SP): as above, brown. |
| | | ML | | B-69D-2.0 | | SILT (ML): dark gray, clayey, stiff, dry. |
| 2 | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: Hand Augered/Slide Hammer
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 0 | | SP | | B-84A-0.5 | | SAND (SP): tan, gravelly, dry. |
| 1 | | | | | | SAND (SP): as above |
| | | ML | | B-84A-2.0 | | SILT (ML): tan, sandy, gravelly, dry. |
| 2 | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: Hand Augered/Slide Hammer/DirectPush
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 0 | | SP | | B-84B-0.5 | | SAND (SP): tan, gravelly, dry. |
| 1 | | | | | | SAND (SP): as above. |
| | | ML | | B-84B-2.0 | | SILT (ML): dark gray, clayey, dry. |
| 2 | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: DirectPush
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 0 | | SP | | B-84C-0.5 | | SAND (SP): tan, gravelly, dry. |
| 1 | | | | | | SAND (SP): as above, brick fragments. |
| | | ML | | B-84C-2.0 | | SILT (ML): dark gray, clayey, stiff, dry. |
| 2 | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

ERM
1777 Botelho Drive
Suite 260
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(925) 946-0455

# BOREHOLE LOG



Project Number: 0020557.10
Project Name: UP Hookston Station
Location: Pleasant Hill, California
Contractor: Vironex
Drilling Method: DirectPush
Logged By: D. Moberg

Total Depth: 2.00'
Borehole Dia.: 2.00in
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA
Date(s): 05/11/06

| Depth (ft) | Graphic Log | USCS Code | Sample Recovery | Sample No. | PID (ppm) | Soil Description and Observations |
|---|---|---|---|---|---|---|
| 0 | | SP | | B-84D-0.5 | | SAND (SP): tan, gravelly, dry. |
| 1 | | | | | | SAND (SP): as above, brick fragments. |
| | | ML | | B-84D-2.0 | | SILT (ML): dark gray, clayey, stiff, dry. |
| 2 | | | | | | Total Depth – 2.0' bgs |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |

*Attachment B*
*Laboratory Analytical Reports*
*and Data Quality Review*

# Memorandum

**Environmental Resources Management**

1777 Botelho Drive
Suite 260
Walnut Creek, CA 94596
(925) 946-0455
(925) 946-9968 (fax)

**To:** Kimberly Lake

**From:** Jackie Luta

**Date:** 20 June 2006

**Subject:** Data Review of UPRR Hookston Station Samples Collected 11 May 2006

**Project Number:** 0020557.10

**Data Package:** STL-Sacramento Data Packages G6E130187 and G6F090417

The quality of the data was assessed and any necessary qualifiers were applied following the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review,* July 2002.

### *HOLDING TIME AND PRESERVATION EVALUATION*

The samples were prepared and analyzed within the method prescribed time period from the date of collection. The sample shipment was received at the laboratory at 8 degrees Celsius (°C), out of the recommended temperature requirement of from 2 to 6 °C. However, the samples were not analyzed for organic constituents and the temperature exceedance is not determined to be significant. None of the data were qualified based on holding time or temperature preservation exceedances.

### *BLANK EVALUATION*

The method blank sample results were nondetected for the target analyte. No data required qualification based on method blank results.

### *BLANK SPIKE EVALUATION*

The laboratory control sample percent recoveries were within the laboratory's limits of acceptance. The laboratory control sample recoveries indicate acceptable laboratory accuracy and precision.

***MATRIX SPIKE EVALUATION***

The matrix spike/matrix spike duplicate recoveries were within the laboratory's limits of acceptance. The matrix spike/matrix spike duplicate recoveries indicate acceptable laboratory accuracy and precision and minimal matrix interference.

***OVERALL ASSESSMENT***

No data required qualification or rejection. All of the data can be used for decision-making purposes. The quality of the data generated during this investigation is acceptable for the preparation of technically defensible documents.

SEVERN TRENT STL

**STL Sacramento**
880 Riverside Parkway
West Sacramento, CA 95605

Tel: 916 373 5600 Fax: 916 372 1059
www.stl-inc.com

June 20, 2006

**STL SACRAMENTO PROJECT NUMBER: G6F090417**
PO/CONTRACT:

Kimberly Lake
Environmental Resources Mgmt.
1777 Botelho Drive
Suite 260
Walnut Creek, CA 94596

Dear Ms. Lake,

This report contains the analytical results for the sample received under chain of custody by STL Sacramento on June 9, 2006. This sample is associated with your 0020557.10 project.

The test results in this report meet all NELAC requirements for parameters that accreditation is required or available. Any exceptions to NELAC requirements are noted in the case narrative. The case narrative is an integral part of this report.

If you have any questions, please feel free to call me at (916) 374-4442.

Sincerely,

Pravani Pillay
Project Manager

## CASE NARRATIVE

## STL SACRAMENTO PROJECT NUMBER G6F090417

There were no anomalies associated with this project.

SEVERN TRENT STL

ACCREDITED IN ACCORDANCE WITH nelac

## STL Sacramento Certifications/Accreditations

| Certifying State | Certificate # | Certifying State | Certificate # |
|---|---|---|---|
| Alaska | UST-055 | Oregon* | CA 200005 |
| Arizona | AZ0616 | Pennsylvania | 68-1272 |
| Arkansas | 04-067-0 | South Carolina | 87014002 |
| California* | 01119CA | Texas | TX 270-2004A |
| Colorado | NA | Utah* | QUAN1 |
| Connecticut | PH-0691 | Virginia | 00178 |
| Florida* | E87570 | Washington | C087 |
| Georgia | 960 | West Virginia | 9930C, 334 |
| Hawaii | NA | Wisconsin | 998204680 |
| Louisiana* | 01944 | NFESC | NA |
| Michigan | 9947 | USACE | NA |
| Nevada | CA44 | USDA Foreign Plant | 37-82605 |
| New Jersey* | CA005 | USDA Foreign Soil | S-46613 |
| New York* | 11666 | | |

*NELAP accredited. A more detailed parameter list is available upon request. Updated 1/27/05

## QC Parameter Definitions

**QC Batch**: The QC batch consists of a set of up to 20 field samples that behave similarly (i.e., same matrix) and are processed using the same procedures, reagents, and standards at the same time.

**Method Blank**: An analytical control consisting of all reagents, which may include internal standards and surrogates, and is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background contamination.

**Laboratory Control Sample and Laboratory Control Sample Duplicate (LCS/LCSD):** An aliquot of blank matrix spiked with known amounts of representative target analytes. The LCS (and LCSD as required) is carried through the entire analytical process and is used to monitor the accuracy of the analytical process independent of potential matrix effects. If an LCSD is performed, it may also used to evaluate the precision of the process.

**Duplicate Sample (DU):** Different aliquots of the same sample are analyzed to evaluate the precision of an analysis.

**Surrogates:** Organic compounds not expected to be detected in field samples, which behave similarly to target analytes. These are added to every sample within a batch at a known concentration to determine the efficiency of the sample preparation and analytical process.

**Matrix Spike and Matrix Spike Duplicate (MS/MSD):** An MS is an aliquot of a matrix fortified with known quantities of specific compounds and subjected to an entire analytical procedure in order to indicate the appropriateness of the method for a particular matrix. The percent recovery for the respective compound(s) is then calculated. The MSD is a second aliquot of the same matrix as the matrix spike, also spiked, in order to determine the precision of the method.

**Isotope Dilution**: For isotope dilution methods, isotopically labeled analogs (internal standards) of the native target analytes are spiked into the sample at time of extraction. These internal standards are used for quantitation, and monitor and correct for matrix effects. Since matrix effects on method performance can be judged by the recovery of these analogs, there is little added benefit of performing MS/MSD for these methods. MS/MSD are only performed for client or QAPP requirements.

**Control Limits:** The reported control limits are either based on laboratory historical data, method requirements, or project data quality objectives. The control limits represent the estimated uncertainty of the test results.

# SAMPLE SUMMARY

**G6F090417**

| WO # | SAMPLE# | CLIENT SAMPLE ID | SAMPLED DATE | SAMP TIME |
|---|---|---|---|---|
| H66AD | 001 | S-09A | 06/07/06 | 10:10 |

**NOTE(S):**

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

G6F090417

# Environmental Resources Management

Fed Ex 7270 2820 1000

# CHAIN OF CUSTODY RECORD

NO: 4541

1777 Botelho Drive, Suite 260 • Walnut Creek, CA • 94596 • (925) 946-0455 • FAX (925) 946-9968



| PROJECT # | PROJECT NAME |
|---|---|
| 0020557.10 | UP Hookston |

| SAMPLER: (PRINT NAME) | (SIGNATURE) |
|---|---|
| D. Ludlam | |

RECEIVING LABORATORY

STL-Sacramento (916)373-5600
880 Riverside Pkwy
West Sacramento, CA 95605

| SAMPLE I.D. | DATE | TIME | COMP | GRAB | SAMPLING METHOD | PRESERVATIVE | ICE (Y/N) | SAMPLING VOLUME | # OF CONTAINERS | MATRIX: SOIL | MATRIX: WATER | MATRIX: GAS | REQUESTED PARAMETERS: ARSENIC ICPMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S-09A | 6/7/06 | 1090 | | X | slide hammer | N | Y | 2x4 | 1 | X | | | X |

RECEIVED IN GOOD CONDITION UNDER COC
JUN - 9 2006
INT.

| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
|---|---|---|---|---|---|
| | 6/7/06 | 1255 | | 6/9/06 | 1315 |
| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
| | | | | | |
| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
| | | | | | |

FIELD REMARKS: Rush analysis required- Contact Kimberly Lake 925-279-3207

| REMARKS ON SAMPLE RECEIPT | ERM REMARKS |
|---|---|
| ☐ BOTTLE INTACT ☐ CUSTODY SEALS ☐ CHILLED<br>☐ PRESERVED ☐ SEALS INTACT ☐ SEE REMARKS | |

SEND REPORT TO: Kimberly Lake

WHITE – LABORATORY COPY CANARY – FIELD COPY PINK – DATABASE GOLD – PROJECT FILE

STL Sacramento (916) 373 - 5600

SEVERN TRENT STL

# LOT RECEIPT CHECKLIST
## STL Sacramento

CLIENT ERM PM PP LOG # 391347

LOT# (QUANTIMS ID) G6F090417 QUOTE# 48416 LOCATION W26D

| | Initials | Date |
|---|---|---|
| DATE RECEIVED 6/9/06 TIME RECEIVED 1315 | CW | 6/9/06 |

DELIVERED BY ☒ FEDEX ☐ CA OVERNIGHT ☐ CLIENT
☐ AIRBORNE ☐ GOLDENSTATE ☐ DHL
☐ UPS ☐ BAX GLOBAL ☐ GO-GETTERS
☐ STL COURIER ☐ COURIERS ON DEMAND
☐ OTHER

CUSTODY SEAL STATUS ☐ INTACT ☐ BROKEN ☒ N/A

CUSTODY SEAL #(S) _____

SHIPPPING CONTAINER(S) ☐ STL ☒ CLIENT ☐ N/A

TEMPERTURE RECORD (IN °C) IR 1 ☐ 3 ☒ ☐ OTHER _____

COC #(S) 4541

TEMPERATURE BLANK Observed: NA Corrected: _____

SAMPLE TEMPERATURE

Observed: 3 Average: 3 Corrected Average: 4

COLLECTOR'S NAME: ☒ Verified from COC ☐ Not on COC

pH MEASURED ☐ YES ☐ ANOMALY ☒ N/A

LABELED BY.....

LABELS CHECKED BY.....

PEER REVIEW _____ ☒ NA

SHORT HOLD TEST NOTIFICATION

SAMPLE RECEIVING
WETCHEM ☒ N/A
VOA-ENCORES ☒ N/A

☐ METALS NOTIFIED OF FILTER/PRESERVE VIA VERBAL & EMAIL ☒ N/A

☒ COMPLETE SHIPMENT RECEIVED IN GOOD CONDITION WITH APPROPRIATE TEMPERATURES, CONTAINERS, PRESERVATIVES ☐ N/A

☐ Clouseau ☐ TEMPERATURE EXCEEDED (2 °C – 6 °C)*1 ☒ N/A

☐ WET ICE ☐ BLUE ICE ☐ GEL PACK ☐ NO COOLING AGENTS USED ☐ PM NOTIFIED

Notes: _____

*1 Acceptable temperature range for State of Wisconsin samples is ≤ 4°C.

LEAVE NO SPACES BLANK. USE "N/A" IF NOT APPLICABLE. INITIAL AND DATE ALL "N/A" ENTRIES.

SEVERN TRENT STL

# Bottle Lot Inventory

Lot ID: G6F090417

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VOA* | | | | | | | | | | | | | | | | | | | | |
| VOAh* | | | | | | | | | | | | | | | | | | | | |
| AGB | | | | | | | | | | | | | | | | | | | | |
| AGBs | | | | | | | | | | | | | | | | | | | | |
| 250AGB | | | | | | | | | | | | | | | | | | | | |
| 250AGBs | | | | | | | | | | | | | | | | | | | | |
| 250AGBn | | | | | | | | | | | | | | | | | | | | |
| 500AGB | | | | | | | | | | | | | | | | | | | | |
| ____AGJ | | | | | | | | | | | | | | | | | | | | |
| 500AGJ | | | | | | | | | | | | | | | | | | | | |
| 250AGJ | | | | | | | | | | | | | | | | | | | | |
| 125AGJ | | | | | | | | | | | | | | | | | | | | |
| ____CGJ | | | | | | | | | | | | | | | | | | | | |
| 500CGJ | | | | | | | | | | | | | | | | | | | | |
| 250CGJ | | | | | | | | | | | | | | | | | | | | |
| 125CGJ | | | | | | | | | | | | | | | | | | | | |
| PJ | | | | | | | | | | | | | | | | | | | | |
| PJn | | | | | | | | | | | | | | | | | | | | |
| 500PJ | | | | | | | | | | | | | | | | | | | | |
| 500PJn | | | | | | | | | | | | | | | | | | | | |
| 500PJna | | | | | | | | | | | | | | | \ | | | | | |
| 500PJzn/na | | | | | | | | | | | | | | | | | | | | |
| 250PJ | | | | | | | | | | | | | | | | | | | | |
| 250PJn | | | | | | | | | | | | | | | | | | | | |
| 250PJna | | | | | | | | | | | | | | | | | | | | |
| 250PJzn/na | | | | | | | | | | | | | | | | | | | | |
| Acetate Tube | | | | | | | | | | | | | | | | | | | | |
| 4 "CT | 1 | | | | | | | | | | | | | | | | | | | |
| Encore | | | | | | | | | | | | | | | | | | | | |
| Folder/filter | | | | | | | | | | | | | | | | | | | | |
| PUF | | | | | | | | | | | | | | | | | | | | |
| Petri/Filter | | | | | | | | | | | | | | | | | | | | |
| XAD Trap | | | | | | | | | | | | | | | | | | | | |
| Ziploc | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

**h** = hydrochloric acid **s** = sulfuric acid **na** = sodium hydroxide **n** = nitric acid **zn** = zinc acetate

Number of VOAs with air bubbles present / total number of VOA's

QA-185 3/05 EM

Page 2

ERM-West

Client Sample ID: S-09A

TOTAL Metals

Lot-Sample #...: G6F090417-001 Matrix.....: WG
Date Sampled...: 06/07/06 Date Received..: 06/09/06

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6165168 | | | | | | |
| Arsenic | 4.2 | 0.20 | mg/kg | SW846 6020 | 06/14/06 | H66AD1AA |
| | | Dilution Factor: 1 | | MDL.....: 0.010 | | |

# QC DATA ASSOCIATION SUMMARY

**G6F090417**

Sample Preparation and Analysis Control Numbers

| SAMPLE# | MATRIX | ANALYTICAL METHOD | LEACH BATCH # | PREP BATCH # | MS RUN# |
|---|---|---|---|---|---|
| 001 | WG | SW846 6020 | | 6165168 | 6165068 |

## METHOD BLANK REPORT

### TOTAL Metals

**Client Lot #...:** G6F090417 **Matrix.....:** SOLID

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **MB Lot-Sample #:** G6F140000-168 **Prep Batch #...:** 6165168 | | | | | | |
| Arsenic | ND | 0.20 | mg/kg | SW846 6020 | 06/14/06 | H7CJF1AA |
| | | Dilution Factor: 1 | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

## LABORATORY CONTROL SAMPLE EVALUATION REPORT

### TOTAL Metals

**Client Lot #...:** G6F090417 **Matrix.....:** SOLID

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|
| **LCS Lot-Sample#:** G6F140000-168 **Prep Batch #...:** 6165168 | | | | | |
| Arsenic | 91 | (76 - 110) | SW846 6020 | 06/14/06 | H7CJF1AC |
| | | Dilution Factor: 1 | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

## LABORATORY CONTROL SAMPLE DATA REPORT

### TOTAL Metals

**Client Lot #...:** G6F090417 **Matrix.....:** SOLID

| PARAMETER | SPIKE AMOUNT | MEASURED AMOUNT | UNITS | PERCNT RECVRY | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|
| **LCS Lot-Sample#:** G6F140000-168 **Prep Batch #...:** 6165168 | | | | | | | |
| Arsenic | 20.0 | 18.2 | mg/kg | 91 | SW846 6020 | 06/14/06 | H7CJF1AC |
| Dilution Factor: 1 | | | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

## MATRIX SPIKE SAMPLE EVALUATION REPORT

### TOTAL Metals

**Client Lot #...:** G6F090417 **Matrix.....:** WG
**Date Sampled...:** 06/07/06 **Date Received..:** 06/09/06

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|
| **MS Lot-Sample #:** G6F090417-001 **Prep Batch #...:** 6165168 | | | | | | | |
| Arsenic | 85 | (76 - 110) | | | SW846 6020 | 06/14/06 | H66AD1AC |
| | 82 | (76 - 110) | 6.7 | (0-20) | SW846 6020 | 06/14/06 | H66AD1AD |
| | | Dilution Factor: 1 | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

## MATRIX SPIKE SAMPLE DATA REPORT

### TOTAL Metals

**Client Lot #...:** G6F090417 **Matrix.....:** WG
**Date Sampled...:** 06/07/06 **Date Received..:** 06/09/06

| PARAMETER | SAMPLE AMOUNT | SPIKE AMT | MEASRD AMOUNT | UNITS | PERCNT RECVRY | RPD | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|---|---|
| **MS Lot-Sample #:** G6F090417-001 **Prep Batch #...:** 6165168 | | | | | | | | | |
| Arsenic | | | | | | | | | |
| | 4.2 | 20.0 | 21.2 | mg/kg | 85 | | SW846 6020 | 06/14/06 | H66AD1AC |
| | 4.2 | 19.0 | 19.9 | mg/kg | 82 | 6.7 | SW846 6020 | 06/14/06 | H66AD1AD |

Dilution Factor: 1

**NOTE(S):**

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Results and reporting limits have been adjusted for dry weight.

SEVERN TRENT STL

**STL Sacramento**
880 Riverside Parkway
West Sacramento, CA 95605

Tel: 916 373 5600 Fax: 916 372 1059
www.stl-inc.com

May 26, 2006

**STL SACRAMENTO PROJECT NUMBER: G6E130187**
PO/CONTRACT:

Brian Bjorklund
Environmental Resources Mgmt.
1777 Botelho Drive
Suite 260
Walnut Creek, CA 94596

Dear Mr. Bjorklund,

This report contains the analytical results for the samples received under chain of custody by STL Sacramento on May 12, 2006. These samples are associated with your 0020557.10 Hookston Station project.

The test results in this report meet all NELAC requirements for parameters that accreditation is required or available. Any exceptions to NELAC requirements are noted in the case narrative. The case narrative is an integral part of this report.

If you have any questions, please feel free to call me at (916) 374-4442.

Sincerely,

Pravani Pillay
Project Manager

## CASE NARRATIVE

## STL SACRAMENTO PROJECT NUMBER G6E130187

### General Comments

The samples were received at 8°C. The collection time for B-69D-2.0 states 15:54 on the chain of custody (COC), the label indicates 15:55. The sample was logged in according to the COC.

There were no other anomalies associated with this project.

SEVERN TRENT STL

ACCREDITED IN ACCORDANCE WITH nelac

## STL Sacramento Certifications/Accreditations

| Certifying State | Certificate # | Certifying State | Certificate # |
|---|---|---|---|
| Alaska | UST-055 | Oregon* | CA 200005 |
| Arizona | AZ0616 | Pennsylvania | 68-1272 |
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| California* | 01119CA | Texas | TX 270-2004A |
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| Connecticut | PH-0691 | Virginia | 00178 |
| Florida* | E87570 | Washington | C087 |
| Georgia | 960 | West Virginia | 9930C, 334 |
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| New Jersey* | CA005 | USDA Foreign Soil | S-46613 |
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*NELAP accredited. A more detailed parameter list is available upon request. Updated 1/27/05

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**Control Limits:** The reported control limits are either based on laboratory historical data, method requirements, or project data quality objectives. The control limits represent the estimated uncertainty of the test results.

# SAMPLE SUMMARY

G6E130187

| WO # | SAMPLE# | CLIENT SAMPLE ID | SAMPLED DATE | SAMP TIME |
|---|---|---|---|---|
| H5DEX | 001 | B-84A-0.5 | 05/11/06 | 10:05 |
| H5DE1 | 002 | B-84A-2.0 | 05/11/06 | 10:50 |
| H5DE2 | 003 | B-84B-0.5 | 05/11/06 | 11:10 |
| H5DE3 | 004 | B-84B-2.0 | 05/11/06 | 14:00 |
| H5DE4 | 005 | B-84C-0.5 | 05/11/06 | 14:15 |
| H5DE5 | 006 | B-84D-2.0 | 05/11/06 | 14:45 |
| H5DE6 | 007 | B-84D-0.5 | 05/11/06 | 14:50 |
| H5DE7 | 008 | B-84C-2.0 | 05/11/06 | 15:10 |
| H5DE8 | 009 | B-69A-0.5 | 05/11/06 | 15:35 |
| H5DE9 | 010 | B-69A-2.0 | 05/11/06 | 15:40 |
| H5DFA | 011 | B-69C-0.5 | 05/11/06 | 15:45 |
| H5DFC | 012 | B-69C-2.0 | 05/11/06 | 15:47 |
| H5DFE | 013 | B-69D-0.5 | 05/11/06 | 15:52 |
| H5DFF | 014 | B-69D-2.0 | 05/11/06 | 15:54 |
| H5DFG | 015 | B-69B-0.5 | 05/11/06 | 16:05 |
| H5DFH | 016 | B-69B-2.0 | 05/11/06 | 16:10 |

**NOTE(S):**

- The analytical results of the samples listed above are presented on the following pages.
- All calculations are performed before rounding to avoid round-off errors in calculated results.
- Results noted as "ND" were not detected at or above the stated limit.
- This report must not be reproduced, except in full, without the written approval of the laboratory.
- Results for the following parameters are never reported on a dry weight basis: color, corrosivity, density, flashpoint, ignitability, layers, odor, paint filter test, pH, porosity pressure, reactivity, redox potential, specific gravity, spot tests, solids, solubility, temperature, viscosity, and weight.

# Environmental Resources Management

# CHAIN OF CUSTODY RECORD

NO: 4348

777 Botelho Drive, Suite 260 • Walnut Creek, CA • 94596 • (925) 946-0455 • FAX (925) 946-9968

Page 1 of 2

G6E130187

| PROJECT # | PROJECT NAME |
|---|---|
| 0070557.10 | Hooker Station |

| SAMPLER: (PRINT NAME) | (SIGNATURE) |
|---|---|
| Doug Moberg | Doug Moberg |

RECEIVING LABORATORY: STL - Sacramento

| SAMPLE I.D. | DATE | TIME | COMP | GRAB | SAMPLING METHOD | PRESERVATIVE | ICE (Y/N) | SAMPLING VOLUME | # OF CONTAINERS | MATRIX: SOIL | MATRIX: WATER | MATRIX: GAS | REQUESTED PARAMETERS: Arsenic Lead |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-84A-0.5 | 5/1/06 | 1005 | | X | Direct Push | — | Y | 2x6" Sleeve | 1 | X | | | X |
| B-84A-2.0 | | 1050 | | X | | — | Y | | 1 | X | | | X |
| B-84B-0.5 | | 1110 | | X | | — | Y | | 1 | X | | | X |
| B-84B-2.0 | | 1100 | | X | | — | Y | | 1 | X | | | X |
| B-84C-0.5 | | 1145 | | X | | — | Y | | 1 | X | | | X |
| B-84D-2.0 | | 1140 | | X | | — | Y | | 1 | X | | | X |
| B-84D-0.5 | | 1050 | | X | | — | Y | | 1 | X | | | X |
| B-84C-2.0 | | 1510 | | X | | — | Y | | 1 | X | | | X |
| B-84A-0.5 | | 1535 | | X | | — | Y | | 1 | X | | | X |
| B-84A-2.0 | | 1540 | | X | | — | Y | | 1 | X | | | X |

| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
|---|---|---|---|---|---|
| Doug Moberg | 5/1/06 | 1740 | Cheng Vue | 5/2/06 | 1205 |
| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
| | | | | | |
| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
| | | | | | |

FIELD REMARKS: UPRR Project Manager Mike Grant. Direct Bill

REMARKS ON SAMPLE RECEIPT

- ☑ BOTTLE INTACT
- ☐ CUSTODY SEALS
- ☐ CHILLED
- ☐ PRESERVED
- ☐ SEALS INTACT
- ☐ SEE REMARKS

ERM REMARKS

SEND REPORT TO: Brian Gjerdeland

WHITE – LABORATORY COPY  CANARY – FIELD COPY  PINK – DATABASE  GOLD – PROJECT FILE

STL Sacramento (916) 372-1500

4 of 30

G6E130187

# Environmental Resources Management

# CHAIN OF CUSTODY RECORD

NO: 3955

1777 Botelho Drive, Suite 260 ● Walnut Creek, CA 94596 ● (925) 946-0455 ● FAX (925) 946-9968

Page 2 of 2

| PROJECT # | PROJECT NAME |
|---|---|
| 002055.T.10 | Hoadley Station |

| SAMPLER: (PRINT NAME) | (SIGNATURE) |
|---|---|
| Doug Moberg | |

RECEIVING LABORATORY: STL Sacramento

| SAMPLE I.D. | DATE | TIME | COMP | GRAB | SAMPLING METHOD | PRESERVATIVE | ICE (Y/N) | SAMPLING VOLUME | # OF CONTAINERS | MATRIX: SOIL | MATRIX: WATER | MATRIX: GAS | REQUESTED PARAMETERS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B-69C-0.5 | 5/11/06 | 1515 | | X | | | Y | | 1 | X | | | X |
| B-69C-2.0 | | 1490 | | X | | | Y | | 1 | X | | | X |
| B-69D-0.5 | | 1552 | | X | | | Y | | 1 | X | | | X |
| B-69D-2.0 | | 1534 | | X | | | Y | | 1 | X | | | X |
| B-69E-0.5 | | 1605 | | X | | | Y | | 1 | X | | | X |
| B-69E-2.0 | | 1610 | | X | | | Y | | 1 | X | | | X |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
|---|---|---|---|---|---|
| | 5/11/06 | 1700 | Cheng Che | 5/12/06 | 1205 |
| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
| | | | | | |
| RELINQUISHED BY (SIGNATURE) | DATE | TIME | RECEIVED BY | DATE | TIME |
| | | | | | |

FIELD REMARKS

REMARKS ON SAMPLE RECEIPT

- [x] BOTTLE INTACT
- [ ] CUSTODY SEALS
- [ ] CHILLED
- [ ] PRESERVED
- [ ] SEALS INTACT
- [ ] SEE REMARKS

ERM REMARKS

SEND REPORT TO:

WHITE - LABORATORY COPY CANARY - FIELD COPY PINK - DATABASE MANAGER GOLD - PROJECT FILE

STL Sacramento (916) 373 - 5600

# Rec'd labeled @ 1555 - CV 5/12/06

SEVERN TRENT **STL**

# LOT RECEIPT CHECKLIST
## STL Sacramento

CLIENT ERM PM PP LOG # 38836

LOT# (QUANTIMS ID) G6E130187 QUOTE# 48416 LOCATION W2E

| | Initials | Date |
|---|---|---|
| | CV | 5/12/06 |

DATE RECEIVED 5/12/06 TIME RECEIVED 0905

DELIVERED BY
- ☑ FEDEX
- ☐ CA OVERNIGHT
- ☐ CLIENT
- ☐ AIRBORNE
- ☐ GOLDENSTATE
- ☐ DHL
- ☐ UPS
- ☐ BAX GLOBAL
- ☐ GO-GETTERS
- ☐ STL COURIER
- ☐ COURIERS ON DEMAND
- ☐ OTHER

CUSTODY SEAL STATUS ☐ INTACT ☐ BROKEN ☑ N/A

CUSTODY SEAL #(S)

SHIPPPING CONTAINER(S) ☐ STL ☑ CLIENT ☐ N/A

TEMPERTURE RECORD (IN °C) IR 1 ☐ 3 ☑ ☐ OTHER

COC #(S) 4345, 3955

TEMPERATURE BLANK Observed: NA Corrected:

SAMPLE TEMPERATURE

Observed: 4 / 7 / 14 Average: 8 Corrected Average: 8

COLLECTOR'S NAME: ☑ Verified from COC ☐ Not on COC

pH MEASURED ☐ YES ☐ ANOMALY ☑ N/A

| | | |
|---|---|---|
| LABELED BY | CM | 5-13-06 |
| LABELS CHECKED BY | | |
| PEER REVIEW ☑ NA | | |

SHORT HOLD TEST NOTIFICATION

SAMPLE RECEIVING
- WETCHEM ☑ N/A
- VOA-ENCORES ☑ N/A

☐ METALS NOTIFIED OF FILTER/PRESERVE VIA VERBAL & EMAIL ☑ N/A

☐ COMPLETE SHIPMENT RECEIVED IN GOOD CONDITION WITH APPROPRIATE TEMPERATURES, CONTAINERS, PRESERVATIVES ☑ N/A

☑ Clouseau ☑ TEMPERATURE EXCEEDED (2 °C – 6 °C)*1 ☐ N/A

☑ WET ICE ☐ BLUE ICE ☐ GEL PACK ☐ NO COOLING AGENTS USED ☑ PM NOTIFIED

Notes: 1 bag A bag of wet ice used Bag on top of all Samples. Rec'd B-690-2.0 labeled @ 1555, COC list @ 1554.

*1 Acceptable temperature range for State of Wisconsin samples is ≤ 4°C.

LEAVE NO SPACES BLANK. USE "N/A" IF NOT APPLICABLE. INITIAL ALL "N/A" ENTRIES.

SEVERN TRENT STL

# Bottle Lot Inventory

Lot ID: G6E130187

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VOA* | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / |
| VOAh* | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / | / |
| AGB | | | | | | | | | | | | | | | | | | | | |
| AGBs | | | | | | | | | | | | | | | | | | | | |
| 250AGB | | | | | | | | | | | | | | | | | | | | |
| 250AGBs | | | | | | | | | | | | | | | | | | | | |
| 250AGBn | | | | | | | | | | | | | | | | | | | | |
| 500AGB | | | | | | | | | | | | | | | | | | | | |
| ____AGJ | | | | | | | | | | | | | | | | | | | | |
| 500AGJ | | | | | | | | | | | | | | | | | | | | |
| 250AGJ | | | | | | | | | | | | | | | | | | | | |
| 125AGJ | | | | | | | | | | | | | | | | | | | | |
| ____CGJ | | | | | | | | | | | | | | | | | | | | |
| 500CGJ | | | | | | | | | | | | | | | | | | | | |
| 250CGJ | | | | | | | | | | | | | | | | | | | | |
| 125CGJ | | | | | | | | | | | | | | | | | | | | |
| PJ | | | | | | | | | | | | | | | | | | | | |
| PJn | | | | | | | | | | | | | | | | | | | | |
| 500PJ | | | | | | | | | | | | | | | | | | | | |
| 500PJn | | | | | | | | | | | | | | | | | | | | |
| 500PJna | | | | | | | | | | | | | | | | | | | | |
| 500PJzn/na | | | | | | | | | | | | | | | | | | | | |
| 250PJ | | | | | | | | | | | | | | | | | | | | |
| 250PJn | | | | | | | | | | | | | | | | | | | | |
| 250PJna | | | | | | | | | | | | | | | | | | | | |
| 250PJzn/na | | | | | | | | | | | | | | | | | | | | |
| Acetate Tube | | | | / | / | / | / | / | / | / | / | / | / | / | / | / | | | | |
| 6 "CT | / | / | / | | | | | | | | | | | | | | | | | |
| Encore | | | | | | | | | | | | | | | | | | | | |
| Folder/filter | | | | | | | | | | | | | | | | | | | | |
| PUF | | | | | | | | | | | | | | | | | | | | |
| Petri/Filter | | | | | | | | | | | | | | | | | | | | |
| XAD Trap | | | | | | | | | | | | | | | | | | | | |
| Ziploc | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

**h** = hydrochloric acid **s** = sulfuric acid **na** = sodium hydroxide **n** = nitric acid **zn** = zinc acetate

Number of VOAs with air bubbles present / total number of VOA's

QA-185 3/05 EM

Page 2

ERM-West

Client Sample ID: B-84A-0.5

TOTAL Metals

**Lot-Sample #...:** G6E130187-001 **Matrix.....:** SO
**Date Sampled...:** 05/11/06 **Date Received..:** 05/12/06
**% Moisture.....:** 2.4

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 6137337 | | | | | | |
| **Arsenic** | **2.7** | **0.20** | **mg/kg** | **SW846 6020** | **05/18-05/22/06** | **H5DEX1AC** |
| | | Dilution Factor: 1 | | MDL.....: 0.051 | | |

**NOTE(S):**

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-84A-2.0

TOTAL Metals

Lot-Sample #...: G6E130187-002
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 4.5
Matrix.....: SO

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 5.5 | 0.21 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DE11AC |
| | | Dilution Factor: 1 | | MDL.....: 0.052 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-84B-0.5

TOTAL Metals

Lot-Sample #...: G6E130187-003 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 2.5

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 16.6 | 0.21 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DE21AC |
| | | Dilution Factor: 1 | | MDL.....: 0.051 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-84B-2.0

TOTAL Metals

Lot-Sample #...: G6E130187-004 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 15

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 8.5 | 0.23 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DE31AC |
| | | Dilution Factor: 1 | | MDL.....: 0.058 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-84C-0.5

TOTAL Metals

Lot-Sample #...: G6E130187-005 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 5.6

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 12.3 | 0.21 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DE41AC |
| | | Dilution Factor: 1 | | MDL.....: 0.053 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-84D-2.0

TOTAL Metals

**Lot-Sample #...:** G6E130187-006 **Matrix.....:** SO
**Date Sampled...:** 05/11/06 **Date Received..:** 05/12/06
**% Moisture.....:** 18

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 6137337 | | | | | | |
| **Arsenic** | **15.3** | **0.24** | **mg/kg** | **SW846 6020** | **05/18-05/22/06** | **H5DE51AC** |
| | | Dilution Factor: 1 | | MDL.....: 0.060 | | |

**NOTE(S):**

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-84D-0.5

TOTAL Metals

Lot-Sample #...: G6E130187-007 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 6.7

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 9.7 | 0.21 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DE61AC |
| | | Dilution Factor: 1 | | MDL.....: 0.053 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-84C-2.0

TOTAL Metals

Lot-Sample #...: G6E130187-008 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 18

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 17.3 | 0.24 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DE71AC |
| | | Dilution Factor: 1 | | MDL.....: 0.060 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69A-0.5

TOTAL Metals

**Lot-Sample #...:** G6E130187-009 **Matrix.....:** SO
**Date Sampled...:** 05/11/06 **Date Received..:** 05/12/06
**% Moisture.....:** 1.8

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 6137337 | | | | | | |
| **Arsenic** | **0.94** | **0.20** | **mg/kg** | **SW846 6020** | **05/18-05/22/06** | **H5DE81AC** |
| | | Dilution Factor: 1 | | MDL.....: 0.051 | | |

**NOTE(S):**

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69A-2.0

TOTAL Metals

Lot-Sample #...: G6E130187-010 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 3.5

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 252 | 0.21 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DE91AC |
| | | Dilution Factor: 1 | | MDL.....: 0.052 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69C-0.5

TOTAL Metals

Lot-Sample #...: G6E130187-011 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 2.4

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 0.56 | 0.20 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DFA1AC |
| | | Dilution Factor: 1 | | MDL.....: 0.051 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69C-2.0

TOTAL Metals

Lot-Sample #...: G6E130187-012 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 9.4

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 171 | 0.22 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DFC1AC |
| | | Dilution Factor: 1 | | MDL.....: 0.055 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69D-0.5

TOTAL Metals

**Lot-Sample #...:** G6E130187-013 **Matrix.....:** SO
**Date Sampled...:** 05/11/06 **Date Received..:** 05/12/06
**% Moisture.....:** 4.0

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 6137337 | | | | | | |
| **Arsenic** | **5.4** | **0.21** | **mg/kg** | **SW846 6020** | **05/18-05/22/06** | **H5DFE1AC** |
| | | Dilution Factor: 1 | | MDL.....: 0.052 | | |

**NOTE(S):**

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69D-2.0

TOTAL Metals

Lot-Sample #...: G6E130187-014 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 17

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 9.7 | 0.24 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DFF1AC |
| | | Dilution Factor: 1 | | MDL.....: 0.060 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69B-0.5

TOTAL Metals

Lot-Sample #...: G6E130187-015 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 1.9

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 23.4 | 0.20 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DFG1AC |
| | | Dilution Factor: 1 | | MDL.....: 0.051 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

ERM-West

Client Sample ID: B-69B-2.0

TOTAL Metals

Lot-Sample #...: G6E130187-016 Matrix.....: SO
Date Sampled...: 05/11/06 Date Received..: 05/12/06
% Moisture.....: 17

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 6137337 | | | | | | |
| Arsenic | 37.2 | 0.24 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5DFH1AC |
| | | Dilution Factor: 1 | | MDL.....: 0.060 | | |

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

# QC DATA ASSOCIATION SUMMARY

G6E130187

Sample Preparation and Analysis Control Numbers

| SAMPLE# | MATRIX | ANALYTICAL METHOD | LEACH BATCH # | PREP BATCH # | MS RUN# |
|---|---|---|---|---|---|
| 001 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 002 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 003 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 004 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 005 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 006 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 007 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 008 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 009 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 010 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 011 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 012 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 013 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 014 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |

(Continued on next page)

# QC DATA ASSOCIATION SUMMARY

**G6E130187**

Sample Preparation and Analysis Control Numbers

| SAMPLE # | MATRIX | ANALYTICAL METHOD | LEACH BATCH # | PREP BATCH # | MS RUN# |
|---|---|---|---|---|---|
| 015 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |
| 016 | SO | SW846 6020 | | 6137337 | 6137196 |
| | SO | ASTM D 2216-90 | | 6142403 | 6142213 |

## METHOD BLANK REPORT

### TOTAL Metals

**Client Lot #...:** G6E130187 **Matrix.....:** SOLID

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **MB Lot-Sample #:** G6E170000-337 **Prep Batch #...:** 6137337 | | | | | | |
| Arsenic | ND | 0.20 | mg/kg | SW846 6020 | 05/18-05/22/06 | H5JWV1AA |
| | | Dilution Factor: 1 | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

## LABORATORY CONTROL SAMPLE EVALUATION REPORT

### TOTAL Metals

**Client Lot #...:** G6E130187 **Matrix.....:** SOLID

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|
| **LCS Lot-Sample#:** G6E170000-337 **Prep Batch #...:** 6137337 | | | | | |
| Arsenic | 92 | (79 - 110) | SW846 6020 | 05/18-05/22/06 | H5JWV1AC |
| | | Dilution Factor: 1 | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

## LABORATORY CONTROL SAMPLE DATA REPORT

### TOTAL Metals

**Client Lot #...:** G6E130187 **Matrix.....:** SOLID

| PARAMETER | SPIKE AMOUNT | MEASURED AMOUNT | UNITS | PERCNT RECVRY | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|
| **LCS Lot-Sample#:** G6E170000-337 **Prep Batch #...:** 6137337 | | | | | | | |
| Arsenic | 20.0 | 18.4 | mg/kg | 92 | SW846 6020 | 05/18-05/22/06 | H5JWV1AC |
| | | Dilution Factor: 1 | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

## MATRIX SPIKE SAMPLE EVALUATION REPORT

### TOTAL Metals

**Client Lot #...:** G6E130187 **Matrix.....:** SO
**Date Sampled...:** 05/11/06 **Date Received..:** 05/12/06

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|
| **MS Lot-Sample #:** G6E130187-001 **Prep Batch #...:** 6137337 | | | | | | | |
| Arsenic | 85 | (79 - 110) | | | SW846 6020 | 05/18-05/22/06 | H5DEX1AD |
| | 85 | (79 - 110) | 0.08 | (0-20) | SW846 6020 | 05/18-05/22/06 | H5DEX1AE |

Dilution Factor: 1

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

## MATRIX SPIKE SAMPLE DATA REPORT

### TOTAL Metals

**Client Lot #...:** G6E130187 **Matrix.....:** SO
**Date Sampled...:** 05/11/06 **Date Received..:** 05/12/06

| PARAMETER | SAMPLE AMOUNT | SPIKE AMT | MEASRD AMOUNT | UNITS | PERCNT RECVRY | RPD | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|---|---|---|
| **MS Lot-Sample #:** G6E130187-001 **Prep Batch #...:** 6137337 | | | | | | | | | |
| Arsenic | | | | | | | | | |
| | 2.7 | 20.3 | 20.0 | mg/kg | 85 | | SW846 6020 | 05/18-05/22/06 | H5DEX1AD |
| | 2.7 | 20.3 | 20.0 | mg/kg | 85 | 0.08 | SW846 6020 | 05/18-05/22/06 | H5DEX1AE |
| | | | Dilution Factor: 1 | | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Results and reporting limits have been adjusted for dry weight.

*Appendix B*
*Soil Vapor Sampling*

## *APPENDIX B – SOIL VAPOR SAMPLING*

Additional soil vapor sampling activities were conducted in June 2006 to support remedial alternative evaluations for the Feasibility Study. This appendix describes the field activities and presents the results of the soil vapor sampling activities.

## *SCOPE OF WORK*

Active soil vapor sampling was completed at three locations (ASV-13 to ASV-15) on 1 June 2006. One ambient air sample was also collected during this time. The active soil vapor sampling points were located within the downgradient portion of the Colony Park residential neighborhood, generally beyond the high concentration trichloroethylene (TCE) impacts (>500 micrograms per liter TCE in groundwater) but along the plume axis. Based on previous data, a good correlation between soil vapor concentrations and indoor air impacts has generally been observed. This study was conducted to refine our understanding of the potential downgradient area of indoor air impacts. These data will supplement the previous soil vapor sampling data and indoor air data collected in the neighborhood. Sampling locations of ASV-13 through ASV-15, as well as previous sampling locations (ASV-1 through ASV-14) and the 10 permanent soil vapor probes (SVP-1 through SVP-10) are shown on Figure B-1.

The active soil vapor samples were collected with the use of a direct-push sampling rig equipped with 1-inch diameter steel vapor probes with 1/8-inch flexible nylon tubing. At each location, the vapor probe was advanced to 5 feet below ground surface and then slightly withdrawn to open the sampling tip and expose the vapor sampling port. To minimize ambient air leakage within the sampling system, bentonite seals were placed at the ground surface along the outside of the sampling rods, and at the top of the sampling rods where the sample tubing is located. Soil vapor was then withdrawn from the tubing using a graduated syringe. Prior to soil vapor sample collection at each location, a vacuum check was performed, the syringe was leak-checked, and the tubing was purged to fill it with soil vapor. Samples were collected into a 6-liter Summa canister using a 200 milliliter per minute flow controller. During sampling, leak tests were performed using isopropyl alcohol (2-propanol).

The soil vapor and ambient air samples were analyzed for volatile organic compounds (VOCs) by Method TO-15 at Air Toxics, Ltd., in Sacramento, California.

Soil vapor sampling activities were conducted in accordance with the 15 December 2005 (revised 7 February 2005) *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* and the *Advisory – Active Soil Gas Investigations* (28 January 2003) documents developed by the Department of Toxic Substances Control and the California Environmental Protection Agency.

## *SOIL VAPOR SAMPLE RESULTS*

Chlorinated VOCs, including TCE and associated degradation compounds, were not detected in the soil vapor samples. However, low levels of 20 different VOCs that do not originate from the Hookston Station Parcel were detected in one or more of the soil vapor samples. These VOCs are mostly petroleum-related compounds, and include benzene, toluene, ethylbenzene, xylenes, and 1,2,4-trimethylbenzene. The sample results are summarized on Table B-1, and the laboratory analytical report is included as Attachment A to this appendix. ERM conducted a data quality review of the soil vapor results. As noted in that review, which is also included in Attachment A, no data required qualification or rejection.

The results were compared with the soil vapor Environmental Screening Levels (ESLs)(Regional Water Quality Control Board 2005) and the California Human Health Screening Levels (CHHSLs)(California Environmental Protection Agency 2005) for residential land use scenarios. VOCs detected during the June 2006 soil vapor sampling activities did not exceed the ESLs or CHHSLs.

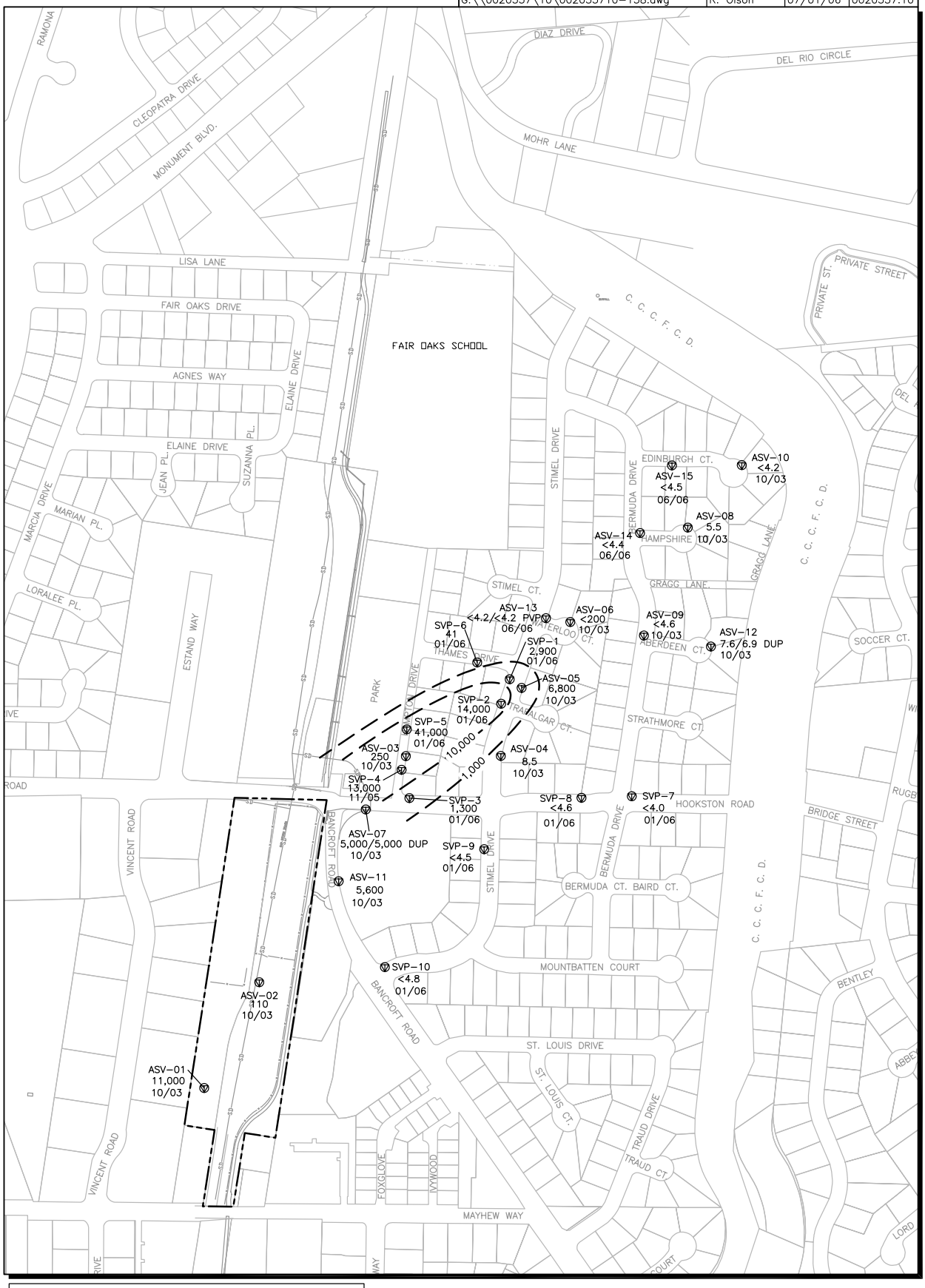
## *REFERENCES*

California Environmental Protection Agency. 2005. *Use of California Human Health Screening Levels in Evaluation of Contaminated Properties.* January 2005.

Regional Water Quality Control Board. 2005. *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 1: Summary Tier 1 Lookup Tables.* Interim Final February 2005.

*Figure*

| CAD File: | Drawn By: | Date: | Project No. |
|---|---|---|---|
| G:\\0020557\10\002055710-138.dwg | R. Olson | 07/01/06 | 0020557.10 |




LEGEND

| | |
|---|---|
| ▽ | Soil Vapor Monitoring Probe Location |
| ——— | Hookston Station Parcel Property Boundary |
| 100 - - - | TCE Soil Vapor Concentration Contour (µg/m³) |
| 190 | TCE Soil Vapor Concentration (µg/m³) |
| DUP | Duplicate |
| NS | Not Sampled |

N

0 300

FEET

Figure B-1

*TCE in Active Soil Vapor Samples*
*October 2003 - June 2006*
*Hookston Station*
*Pleasant Hill, California*

ERM 06/06

*Table*

***Table B-1***
***June 2006 Active Soil Gas Sampling Results***
***Hookston Station***
***Pleasant Hill, California***

| Location | Date | Depth (feet) | Laboratory | Analytical Method | PCE ($\mu g/m^3$) | TCE ($\mu g/m^3$) | cis-1,2-DCE ($\mu g/m^3$) | trans-1,2-DCE ($\mu g/m^3$) | 1,1-DCE ($\mu g/m^3$) | 1,3-butadiene ($\mu g/m^3$) | Hexane ($\mu g/m^3$) | Cyclohexane ($\mu g/m^3$) | Heptane ($\mu g/m^3$) | CDS ($\mu g/m^3$) | Acetone ($\mu g/m^3$) | Benzene ($\mu g/m^3$) | 2-Butanone ($\mu g/m^3$) | Ethyl Benzene ($\mu g/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Residential Land Use Samples** | | | | *RWQCB Residential ESL* | *410* | *1,200* | *7,300* | *15,000* | *42,000* | - | - | - | - | - | *73,000* | *84* | *2,400* | *2,200* |
| | | | | *California Residential CHHSL* | *180* | *528* | *15,900* | *31,900* | - | - | - | - | - | - | - | *36.2* | - | - |
| ASV-13 | 6/1/2006 | 5 | ATL | TO-15 | <5.4 | <4.2 | <3.1 | <3.1 | <3.1 | <1.7 | <2.8 | <2.7 | <3.2 | <2.5 | <7.5 | <2.5 | <2.3 | <3.4 |
| ASV-13 Dup | 6/1/2006 | 5 | ATL | TO-15 | <5.4 | <4.2 | <3.1 | <3.1 | <3.1 | <1.7 | <2.8 | <2.7 | <3.2 | <2.5 | <7.5 | <2.5 | <2.3 | <3.4 |
| ASV-14 | 6/1/2006 | 5 | ATL | TO-15 | <5.6 | <4.4 | <3.2 | <3.2 | <3.2 | 15 | 26 | 3.0 | 6.2 | 3.0 | 120 | 7.2 | 29 | 9.7 |
| ASV-15 | 6/1/2006 | 5 | ATL | TO-15 | <5.7 | <4.5 | <3.3 | <3.3 | <3.3 | 6.2 | 28 | <2.9 | <3.4 | <2.6 | 34 | <2.7 | 4.2 | 13 |
| **Ambient Air Samples** | | | | | | | | | | | | | | | | | | |
| Ambient Air | 6/1/2006 | ambient air | ATL | TO-15 | <5.9 | <4.7 | <3.5 | <3.5 | <3.5 | <1.9 | <3.1 | <3.0 | <3.6 | <2.7 | <8.3 | <2.8 | <2.6 | <3.8 |

**Notes:**
ATL = Air Toxics, Ltd.
CalEPA = California Environmental Protection Agency
CDS = carbon disulfide
CHHSL = CalEPA Human Health Screening Level for soil vapor (CalEPA 2005)
DCE = Dichloroethene
Dup = duplicate sample
ESL = Environmental Screening Level for soil vapor (RWQCB 2005)
PCE = Tetrachloroethene
RWQCB = Regional Water Quality Control Board
TCE = Trichloroethene
TMB = Trimethylbenzene
U = Qualified as non-detect. Common laboratory contaminants at concentrations less than 10 times the practical quanititation limit.
$\mu g/m^3$ = micrograms per cubic meter
2-Propanol was used for detecting leaks within the sampling system.

***Table B-1***
***June 2006 Active Soil Gas Sampling Results***
***Hookston Station***
***Pleasant Hill, California***

| Location | Date | Depth (feet) | Laboratory | Analytical Method | 4-ethyltoluene ($\mu g/m^3$) | Toluene ($\mu g/m^3$) | m-&p-Xylenes ($\mu g/m^3$) | o-Xylene ($\mu g/m^3$) | Ethanol ($\mu g/m^3$) | 2-Propanol ($\mu g/m^3$) | Tetrahydrofuran ($\mu g/m^3$) | 4-methyl-2-pentanone ($\mu g/m^3$) | Propylbenzene ($\mu g/m^3$) | 1,3,5-TMB ($\mu g/m^3$) | 1,2,4-TMB ($\mu g/m^3$) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Residential Land Use Samples** | | | | *RWQCB Residential ESL* | - | *83,000* | - | - | *19,000,000* | - | - | - | - | - | - |
| | | | | *California Residential CHHSL* | - | *135,000* | *317,000* | *315,000* | - | - | - | - | - | - | - |
| ASV-13 | 6/1/2006 | 5 | ATL | TO-15 | 9.5 | <3.0 | 9.7 | 4.5 | <6.0 | 250 | <2.3 | <3.2 | <3.9 | 4.7 | 18 |
| ASV-13 Dup | 6/1/2006 | 5 | ATL | TO-15 | 10 | <3.0 | 9.6 | 4.5 | <6.0 | 250 | <2.3 | <3.2 | <3.9 | 4.8 | 18 |
| ASV-14 | 6/1/2006 | 5 | ATL | TO-15 | 30 | 11 | 47 | 23 | 21 | 28 | 3.1 | 3.7 | 4.9 | 17 | 59 |
| ASV-15 | 6/1/2006 | 5 | ATL | TO-15 | 52 | 8.6 | 80 | 38 | 9.3 | 30 | <2.5 | <3.4 | 9.1 | 22 | 71 |
| **Ambient Air Samples** | | | | | | | | | | | | | | | |
| Ambient Air | 6/1/2006 | ambient air | ATL | TO-15 | <4.3 | <3.3 | <3.8 | <3.8 | <6.6 | <8.6 | <2.6 | <3.6 | <4.3 | <4.3 | <4.3 |

**Notes:**
ATL = Air Toxics, Ltd.
CalEPA = California Environmental Protection Agency
CDS = carbon disulfide
CHHSL = CalEPA Human Health Screening Level for soil vapor (CalEPA 2005)
DCE = Dichloroethene
Dup = duplicate sample
ESL = Environmental Screening Level for soil vapor (RWQCB 2005)
PCE = Tetrachloroethene
RWQCB = Regional Water Quality Control Board
TCE = Trichloroethene
TMB = Trimethylbenzene
U = Qualified as non-detect. Common laboratory contaminants at concentrations less than 10 times the practical quanititation limit.
$\mu g/m^3$ = micrograms per cubic meter
2-Propanol was used for detecting leaks within the sampling system.

*Attachment A*
*Soil Vapor Laboratory Analytical Report and Data Quality Review*

# Memorandum

**Environmental Resources Management**

1777 Botelho Drive
Suite 260
Walnut Creek, CA 94596
(925) 946-0455
(925) 946-9968 (fax)

**To:** Kimberly Lake

**From:** Jackie Luta

**Date:** 21 June 2006

**Subject:** Data Review of UPRR Hookston Station Samples Collected 01 June 2006

**Project Number:** 0020557.10

**Data Package:** Air Toxics Data Package 0606023

The quality of the data was assessed and any necessary qualifiers were applied following the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review,* October 1999.

### *HOLDING TIME AND PRESERVATION EVALUATION*

The samples were prepared and analyzed within the method prescribed time period from the date of collection. None of the data were qualified based on holding time exceedances.

### *BLANK EVALUATION*

The method blank and trip blank sample results were nondetected for each of the target analytes. The ambient air sample had no detections of target analytes. No data required qualification based on blank results.

### *BLANK SPIKE EVALUATION*

The laboratory control sample (LCS) percent recoveries (%R) were within the laboratory's limits of acceptance. No data required qualification based on LCS recoveries.

### *SURROGATE SPIKE EVALUATION*

The surrogate recoveries were within acceptable limits. No qualifications to the data were made. The surrogate recoveries indicate minimal matrix interference in the samples.

## *FIELD DUPLICATE EVALUATION*

One field duplicate sample was collected and submitted for analysis. ERM calculated the RPDs between detected results. The USEPA has not established control criteria for duplicate samples; therefore, sample data are not qualified on the basis of duplicate imprecision. The RPDs were less than 10 percent, indicating sample homogeneity. These RPDs are presented in Table 1.

## *OVERALL ASSESSMENT*

No data required qualification or rejection. All of the data can be used for decision-making purposes. The quality of the data generated during this investigation is acceptable for the preparation of technically defensible documents.

***Table 1***
***Field Duplicate Results and Calculated Relative Percent Differences***
***Hookston Station***
***Pleasant Hill, California***

| Lab Package | Sample ID | Compound | Concentration | | Report Limit | Units | RPD (%) |
|---|---|---|---|---|---|---|---|
| | | | Sample | Duplicate | | | |
| 0606023 | ASV-13 | 2-Propanol | 250 | 250 | 7.8 | $\mu g/m^3$ | 0 |
| 0606023 | ASV-13 | m,p-Xylene | 9.7 | 9.6 | 3.4 | $\mu g/m^3$ | 1.0 |
| 0606023 | ASV-13 | o-Xylene | 4.5 | 4.5 | 3.4 | $\mu g/m^3$ | 0 |
| 0606023 | ASV-13 | 4-Ethyltoluene | 9.5 | 10 | 3.9 | $\mu g/m^3$ | 5.1 |
| 0606023 | ASV-13 | 1,3,5-Trimethylbenzene | 4.7 | 4.8 | 3.9 | $\mu g/m^3$ | 2.1 |
| 0606023 | ASV-13 | 1,2,4-Trimethylbenzene | 18 | 18 | 3.9 | $\mu g/m^3$ | 0 |

**Key:**
NC = Not calculated, one result was detected and the other result was nondetected
$\mu g/m^3$ = Micrograms per cubic meter
RPD = Relative percent difference

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- Results; and
- Chain of Custody (copy).

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# AIR TOXICS LTD.

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## WORK ORDER #: 0606023

Work Order Summary

| | | | |
|---|---|---|---|
| **CLIENT:** | Ms. Kimberly Lake<br>ERM-West<br>1777 Botelho Drive<br>Suite 260<br>Walnut Creek, CA 94596 | **BILL TO:** | Mr. Alan Nye<br>Center for Toxicology and Environmental Health<br>615 West Markham Street<br>Little Rock, AR 72201 |
| **PHONE:** | 925-946-0455 | **P.O. #** | 0020557.10 |
| **FAX:** | 925-946-9968 | **PROJECT #** | 0020557.10 Hookston Station |
| **DATE RECEIVED:** | 06/02/2006 | **CONTACT:** | Nicole Danbacher |
| **DATE COMPLETED:** | 06/05/2006 | | |

| FRACTION # | NAME | TEST | RECEIPT VAC./PRES. |
|---|---|---|---|
| 01A | ASV-14 | Modified TO-15 | 5.5 "Hg |
| 02A | Ambient Air 6-1-06 | Modified TO-15 | 7.0 "Hg |
| 02AA | Ambient Air 6-1-06 Duplicate | Modified TO-15 | 7.0 "Hg |
| 03A | ASV-15 | Modified TO-15 | 6.0 "Hg |
| 04A | ASV-13 | Modified TO-15 | 4.5 "Hg |
| 05A | ASV-13-DUP | Modified TO-15 | 4.5 "Hg |
| 06A | Lab Blank | Modified TO-15 | NA |
| 07A | CCV | Modified TO-15 | NA |
| 08A | LCS | Modified TO-15 | NA |

CERTIFIED BY: Linda D. Fruman DATE: 06/05/06

Laboratory Director

Certfication numbers: CA NELAP - 02110CA, LA NELAP/LELAP- AI 30763, NJ NELAP - CA004
NY NELAP - 11291, UT NELAP - 9166389892
Name of Accrediting Agency: NELAP/Florida Department of Health, Scope of Application: Clean Air Act,
Accreditation number: E87680, Effective date: 07/01/05, Expiration date: 06/30/06
Air Toxics Ltd. certifies that the test results contained in this report meet all requirements of the NELAC standards

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(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

**LABORATORY NARRATIVE**
**Modified TO-15**
**ERM-West**
**Workorder# 0606023**

Five 6 Liter Summa Canister samples were received on June 02, 2006. The laboratory performed analysis via modified EPA Method TO-15 using GC/MS in the full scan mode. The method involves concentrating up to 0.2 liters of air. The concentrated aliquot is then flash vaporized and swept through a water management system to remove water vapor. Following dehumidification, the sample passes directly into the GC/MS for analysis.

Method modifications taken to run these samples are summarized in the below table. Specific project requirements may over-ride the ATL modifications.

| *Requirement* | *TO-15* | *ATL Modifications* |
|---|---|---|
| Daily CCV | +- 30% Difference | </= 30% Difference with two allowed out up to </=40%.; flag and narrate outliers |
| Sample collection media | Summa canister | ATL recommends use of summa canisters to insure data defensibility, but will report results from Tedlar bags at client request |
| Method Detection Limit | Follow 40CFR Pt.136 App. B | The MDL met all relevant requirements in Method TO-15 (statistical MDL less than the LOQ). The concentration of the spiked replicate may have exceeded 10X the calculated MDL in some cases |

## Receiving Notes

The Chain of Custody was not relinquished properly. The discrepancy was noted in the Sample Receipt Confirmation email/fax.

## Analytical Notes

The reported LCS for each daily batch has been derived from more than one analytical file.

## Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

# Summary of Detected Compounds
# MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

**Client Sample ID: ASV-14**

**Lab ID#: 0606023-01A**

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| 1,3-Butadiene | 0.82 | 6.8 | 1.8 | 15 |
| Ethanol | 3.3 | 11 | 6.2 | 21 |
| Acetone | 3.3 | 52 | 7.8 | 120 |
| 2-Propanol | 3.3 | 11 | 8.1 | 28 |
| Carbon Disulfide | 0.82 | 0.95 | 2.6 | 3.0 |
| Hexane | 0.82 | 7.4 | 2.9 | 26 |
| 2-Butanone (Methyl Ethyl Ketone) | 0.82 | 9.8 | 2.4 | 29 |
| Tetrahydrofuran | 0.82 | 1.0 | 2.4 | 3.1 |
| Cyclohexane | 0.82 | 0.89 | 2.8 | 3.0 |
| Benzene | 0.82 | 2.2 | 2.6 | 7.2 |
| Heptane | 0.82 | 1.5 | 3.4 | 6.2 |
| 4-Methyl-2-pentanone | 0.82 | 0.90 | 3.4 | 3.7 |
| Toluene | 0.82 | 2.9 | 3.1 | 11 |
| Ethyl Benzene | 0.82 | 2.2 | 3.6 | 9.7 |
| m,p-Xylene | 0.82 | 11 | 3.6 | 47 |
| o-Xylene | 0.82 | 5.4 | 3.6 | 23 |
| Propylbenzene | 0.82 | 0.99 | 4.0 | 4.9 |
| 4-Ethyltoluene | 0.82 | 6.0 | 4.0 | 30 |
| 1,3,5-Trimethylbenzene | 0.82 | 3.4 | 4.0 | 17 |
| 1,2,4-Trimethylbenzene | 0.82 | 12 | 4.0 | 59 |

**Client Sample ID: Ambient Air 6-1-06**

**Lab ID#: 0606023-02A**

No Detections Were Found.

**Client Sample ID: Ambient Air 6-1-06 Duplicate**

**Lab ID#: 0606023-02AA**

No Detections Were Found.

**Client Sample ID: ASV-15**

**Lab ID#: 0606023-03A**

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| 1,3-Butadiene | 0.84 | 2.8 | 1.8 | 6.2 |
| Ethanol | 3.4 | 4.9 | 6.3 | 9.3 |

# Summary of Detected Compounds
# MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

**Client Sample ID: ASV-15**

**Lab ID#: 0606023-03A**

| | | | | |
|---|---|---|---|---|
| Acetone | 3.4 | 14 | 8.0 | 34 |
| 2-Propanol | 3.4 | 12 | 8.2 | 30 |
| Hexane | 0.84 | 8.0 | 3.0 | 28 |
| 2-Butanone (Methyl Ethyl Ketone) | 0.84 | 1.4 | 2.5 | 4.2 |
| Toluene | 0.84 | 2.3 | 3.2 | 8.6 |
| Ethyl Benzene | 0.84 | 2.9 | 3.6 | 13 |
| m,p-Xylene | 0.84 | 18 | 3.6 | 80 |
| o-Xylene | 0.84 | 8.9 | 3.6 | 38 |
| Propylbenzene | 0.84 | 1.8 | 4.1 | 9.1 |
| 4-Ethyltoluene | 0.84 | 11 | 4.1 | 52 |
| 1,3,5-Trimethylbenzene | 0.84 | 4.4 | 4.1 | 22 |
| 1,2,4-Trimethylbenzene | 0.84 | 14 | 4.1 | 71 |

**Client Sample ID: ASV-13**

**Lab ID#: 0606023-04A**

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| 2-Propanol | 3.2 | 100 | 7.8 | 250 |
| m,p-Xylene | 0.79 | 2.2 | 3.4 | 9.7 |
| o-Xylene | 0.79 | 1.0 | 3.4 | 4.5 |
| 4-Ethyltoluene | 0.79 | 1.9 | 3.9 | 9.5 |
| 1,3,5-Trimethylbenzene | 0.79 | 0.95 | 3.9 | 4.7 |
| 1,2,4-Trimethylbenzene | 0.79 | 3.6 | 3.9 | 18 |

**Client Sample ID: ASV-13-DUP**

**Lab ID#: 0606023-05A**

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| 2-Propanol | 3.2 | 100 | 7.8 | 250 |
| m,p-Xylene | 0.79 | 2.2 | 3.4 | 9.6 |
| o-Xylene | 0.79 | 1.0 | 3.4 | 4.5 |
| 4-Ethyltoluene | 0.79 | 2.0 | 3.9 | 10 |
| 1,3,5-Trimethylbenzene | 0.79 | 0.98 | 3.9 | 4.8 |
| 1,2,4-Trimethylbenzene | 0.79 | 3.8 | 3.9 | 18 |

**Client Sample ID: ASV-14**

**Lab ID#: 0606023-01A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060411** | **Date of Collection:** | **6/1/06** |
| **Dil. Factor:** | **1.64** | **Date of Analysis:** | **6/4/06 04:29 PM** |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Freon 12 | 0.82 | Not Detected | 4.0 | Not Detected |
| Freon 114 | 0.82 | Not Detected | 5.7 | Not Detected |
| Chloromethane | 3.3 | Not Detected | 6.8 | Not Detected |
| Vinyl Chloride | 0.82 | Not Detected | 2.1 | Not Detected |
| 1,3-Butadiene | 0.82 | 6.8 | 1.8 | 15 |
| Bromomethane | 0.82 | Not Detected | 3.2 | Not Detected |
| Chloroethane | 0.82 | Not Detected | 2.2 | Not Detected |
| Freon 11 | 0.82 | Not Detected | 4.6 | Not Detected |
| Ethanol | 3.3 | 11 | 6.2 | 21 |
| Freon 113 | 0.82 | Not Detected | 6.3 | Not Detected |
| 1,1-Dichloroethene | 0.82 | Not Detected | 3.2 | Not Detected |
| Acetone | 3.3 | 52 | 7.8 | 120 |
| 2-Propanol | 3.3 | 11 | 8.1 | 28 |
| Carbon Disulfide | 0.82 | 0.95 | 2.6 | 3.0 |
| 3-Chloropropene | 3.3 | Not Detected | 10 | Not Detected |
| Methylene Chloride | 0.82 | Not Detected | 2.8 | Not Detected |
| Methyl tert-butyl ether | 0.82 | Not Detected | 3.0 | Not Detected |
| trans-1,2-Dichloroethene | 0.82 | Not Detected | 3.2 | Not Detected |
| Hexane | 0.82 | 7.4 | 2.9 | 26 |
| 1,1-Dichloroethane | 0.82 | Not Detected | 3.3 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 0.82 | 9.8 | 2.4 | 29 |
| cis-1,2-Dichloroethene | 0.82 | Not Detected | 3.2 | Not Detected |
| Tetrahydrofuran | 0.82 | 1.0 | 2.4 | 3.1 |
| Chloroform | 0.82 | Not Detected | 4.0 | Not Detected |
| 1,1,1-Trichloroethane | 0.82 | Not Detected | 4.5 | Not Detected |
| Cyclohexane | 0.82 | 0.89 | 2.8 | 3.0 |
| Carbon Tetrachloride | 0.82 | Not Detected | 5.2 | Not Detected |
| 2,2,4-Trimethylpentane | 0.82 | Not Detected | 3.8 | Not Detected |
| Benzene | 0.82 | 2.2 | 2.6 | 7.2 |
| 1,2-Dichloroethane | 0.82 | Not Detected | 3.3 | Not Detected |
| Heptane | 0.82 | 1.5 | 3.4 | 6.2 |
| Trichloroethene | 0.82 | Not Detected | 4.4 | Not Detected |
| 1,2-Dichloropropane | 0.82 | Not Detected | 3.8 | Not Detected |
| 1,4-Dioxane | 3.3 | Not Detected | 12 | Not Detected |
| Bromodichloromethane | 0.82 | Not Detected | 5.5 | Not Detected |
| cis-1,3-Dichloropropene | 0.82 | Not Detected | 3.7 | Not Detected |
| 4-Methyl-2-pentanone | 0.82 | 0.90 | 3.4 | 3.7 |
| Toluene | 0.82 | 2.9 | 3.1 | 11 |
| trans-1,3-Dichloropropene | 0.82 | Not Detected | 3.7 | Not Detected |
| 1,1,2-Trichloroethane | 0.82 | Not Detected | 4.5 | Not Detected |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: ASV-14**

**Lab ID#: 0606023-01A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060411** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.64** | **Date of Analysis: 6/4/06 04:29 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Tetrachloroethene | 0.82 | Not Detected | 5.6 | Not Detected |
| 2-Hexanone | 3.3 | Not Detected | 13 | Not Detected |
| Dibromochloromethane | 0.82 | Not Detected | 7.0 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.82 | Not Detected | 6.3 | Not Detected |
| Chlorobenzene | 0.82 | Not Detected | 3.8 | Not Detected |
| Ethyl Benzene | 0.82 | 2.2 | 3.6 | 9.7 |
| m,p-Xylene | 0.82 | 11 | 3.6 | 47 |
| o-Xylene | 0.82 | 5.4 | 3.6 | 23 |
| Styrene | 0.82 | Not Detected | 3.5 | Not Detected |
| Bromoform | 0.82 | Not Detected | 8.5 | Not Detected |
| Cumene | 0.82 | Not Detected | 4.0 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.82 | Not Detected | 5.6 | Not Detected |
| Propylbenzene | 0.82 | 0.99 | 4.0 | 4.9 |
| 4-Ethyltoluene | 0.82 | 6.0 | 4.0 | 30 |
| 1,3,5-Trimethylbenzene | 0.82 | 3.4 | 4.0 | 17 |
| 1,2,4-Trimethylbenzene | 0.82 | 12 | 4.0 | 59 |
| 1,3-Dichlorobenzene | 0.82 | Not Detected | 4.9 | Not Detected |
| 1,4-Dichlorobenzene | 0.82 | Not Detected | 4.9 | Not Detected |
| alpha-Chlorotoluene | 0.82 | Not Detected | 4.2 | Not Detected |
| 1,2-Dichlorobenzene | 0.82 | Not Detected | 4.9 | Not Detected |
| 1,2,4-Trichlorobenzene | 3.3 | Not Detected | 24 | Not Detected |
| Hexachlorobutadiene | 3.3 | Not Detected | 35 | Not Detected |

**Container Type: 6 Liter Summa Canister**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 87 | 70-130 |
| 1,2-Dichloroethane-d4 | 100 | 70-130 |
| 4-Bromofluorobenzene | 100 | 70-130 |

**Client Sample ID: Ambient Air 6-1-06**

**Lab ID#: 0606023-02A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060413** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.75** | **Date of Analysis: 6/4/06 06:20 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Freon 12 | 0.88 | Not Detected | 4.3 | Not Detected |
| Freon 114 | 0.88 | Not Detected | 6.1 | Not Detected |
| Chloromethane | 3.5 | Not Detected | 7.2 | Not Detected |
| Vinyl Chloride | 0.88 | Not Detected | 2.2 | Not Detected |
| 1,3-Butadiene | 0.88 | Not Detected | 1.9 | Not Detected |
| Bromomethane | 0.88 | Not Detected | 3.4 | Not Detected |
| Chloroethane | 0.88 | Not Detected | 2.3 | Not Detected |
| Freon 11 | 0.88 | Not Detected | 4.9 | Not Detected |
| Ethanol | 3.5 | Not Detected | 6.6 | Not Detected |
| Freon 113 | 0.88 | Not Detected | 6.7 | Not Detected |
| 1,1-Dichloroethene | 0.88 | Not Detected | 3.5 | Not Detected |
| Acetone | 3.5 | Not Detected | 8.3 | Not Detected |
| 2-Propanol | 3.5 | Not Detected | 8.6 | Not Detected |
| Carbon Disulfide | 0.88 | Not Detected | 2.7 | Not Detected |
| 3-Chloropropene | 3.5 | Not Detected | 11 | Not Detected |
| Methylene Chloride | 0.88 | Not Detected | 3.0 | Not Detected |
| Methyl tert-butyl ether | 0.88 | Not Detected | 3.2 | Not Detected |
| trans-1,2-Dichloroethene | 0.88 | Not Detected | 3.5 | Not Detected |
| Hexane | 0.88 | Not Detected | 3.1 | Not Detected |
| 1,1-Dichloroethane | 0.88 | Not Detected | 3.5 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 0.88 | Not Detected | 2.6 | Not Detected |
| cis-1,2-Dichloroethene | 0.88 | Not Detected | 3.5 | Not Detected |
| Tetrahydrofuran | 0.88 | Not Detected | 2.6 | Not Detected |
| Chloroform | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,1,1-Trichloroethane | 0.88 | Not Detected | 4.8 | Not Detected |
| Cyclohexane | 0.88 | Not Detected | 3.0 | Not Detected |
| Carbon Tetrachloride | 0.88 | Not Detected | 5.5 | Not Detected |
| 2,2,4-Trimethylpentane | 0.88 | Not Detected | 4.1 | Not Detected |
| Benzene | 0.88 | Not Detected | 2.8 | Not Detected |
| 1,2-Dichloroethane | 0.88 | Not Detected | 3.5 | Not Detected |
| Heptane | 0.88 | Not Detected | 3.6 | Not Detected |
| Trichloroethene | 0.88 | Not Detected | 4.7 | Not Detected |
| 1,2-Dichloropropane | 0.88 | Not Detected | 4.0 | Not Detected |
| 1,4-Dioxane | 3.5 | Not Detected | 13 | Not Detected |
| Bromodichloromethane | 0.88 | Not Detected | 5.9 | Not Detected |
| cis-1,3-Dichloropropene | 0.88 | Not Detected | 4.0 | Not Detected |
| 4-Methyl-2-pentanone | 0.88 | Not Detected | 3.6 | Not Detected |
| Toluene | 0.88 | Not Detected | 3.3 | Not Detected |
| trans-1,3-Dichloropropene | 0.88 | Not Detected | 4.0 | Not Detected |
| 1,1,2-Trichloroethane | 0.88 | Not Detected | 4.8 | Not Detected |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: Ambient Air 6-1-06**

**Lab ID#: 0606023-02A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060413** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.75** | **Date of Analysis: 6/4/06 06:20 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Tetrachloroethene | 0.88 | Not Detected | 5.9 | Not Detected |
| 2-Hexanone | 3.5 | Not Detected | 14 | Not Detected |
| Dibromochloromethane | 0.88 | Not Detected | 7.4 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.88 | Not Detected | 6.7 | Not Detected |
| Chlorobenzene | 0.88 | Not Detected | 4.0 | Not Detected |
| Ethyl Benzene | 0.88 | Not Detected | 3.8 | Not Detected |
| m,p-Xylene | 0.88 | Not Detected | 3.8 | Not Detected |
| o-Xylene | 0.88 | Not Detected | 3.8 | Not Detected |
| Styrene | 0.88 | Not Detected | 3.7 | Not Detected |
| Bromoform | 0.88 | Not Detected | 9.0 | Not Detected |
| Cumene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.88 | Not Detected | 6.0 | Not Detected |
| Propylbenzene | 0.88 | Not Detected | 4.3 | Not Detected |
| 4-Ethyltoluene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,3,5-Trimethylbenzene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,2,4-Trimethylbenzene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,3-Dichlorobenzene | 0.88 | Not Detected | 5.3 | Not Detected |
| 1,4-Dichlorobenzene | 0.88 | Not Detected | 5.3 | Not Detected |
| alpha-Chlorotoluene | 0.88 | Not Detected | 4.5 | Not Detected |
| 1,2-Dichlorobenzene | 0.88 | Not Detected | 5.3 | Not Detected |
| 1,2,4-Trichlorobenzene | 3.5 | Not Detected | 26 | Not Detected |
| Hexachlorobutadiene | 3.5 | Not Detected | 37 | Not Detected |

**Container Type: 6 Liter Summa Canister**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 86 | 70-130 |
| 1,2-Dichloroethane-d4 | 103 | 70-130 |
| 4-Bromofluorobenzene | 100 | 70-130 |

**Client Sample ID: Ambient Air 6-1-06 Duplicate**

**Lab ID#: 0606023-02AA**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060417** | **Date of Collection:** | **6/1/06** |
| **Dil. Factor:** | **1.75** | **Date of Analysis:** | **6/4/06 09:04 PM** |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Freon 12 | 0.88 | Not Detected | 4.3 | Not Detected |
| Freon 114 | 0.88 | Not Detected | 6.1 | Not Detected |
| Chloromethane | 3.5 | Not Detected | 7.2 | Not Detected |
| Vinyl Chloride | 0.88 | Not Detected | 2.2 | Not Detected |
| 1,3-Butadiene | 0.88 | Not Detected | 1.9 | Not Detected |
| Bromomethane | 0.88 | Not Detected | 3.4 | Not Detected |
| Chloroethane | 0.88 | Not Detected | 2.3 | Not Detected |
| Freon 11 | 0.88 | Not Detected | 4.9 | Not Detected |
| Ethanol | 3.5 | Not Detected | 6.6 | Not Detected |
| Freon 113 | 0.88 | Not Detected | 6.7 | Not Detected |
| 1,1-Dichloroethene | 0.88 | Not Detected | 3.5 | Not Detected |
| Acetone | 3.5 | Not Detected | 8.3 | Not Detected |
| 2-Propanol | 3.5 | Not Detected | 8.6 | Not Detected |
| Carbon Disulfide | 0.88 | Not Detected | 2.7 | Not Detected |
| 3-Chloropropene | 3.5 | Not Detected | 11 | Not Detected |
| Methylene Chloride | 0.88 | Not Detected | 3.0 | Not Detected |
| Methyl tert-butyl ether | 0.88 | Not Detected | 3.2 | Not Detected |
| trans-1,2-Dichloroethene | 0.88 | Not Detected | 3.5 | Not Detected |
| Hexane | 0.88 | Not Detected | 3.1 | Not Detected |
| 1,1-Dichloroethane | 0.88 | Not Detected | 3.5 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 0.88 | Not Detected | 2.6 | Not Detected |
| cis-1,2-Dichloroethene | 0.88 | Not Detected | 3.5 | Not Detected |
| Tetrahydrofuran | 0.88 | Not Detected | 2.6 | Not Detected |
| Chloroform | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,1,1-Trichloroethane | 0.88 | Not Detected | 4.8 | Not Detected |
| Cyclohexane | 0.88 | Not Detected | 3.0 | Not Detected |
| Carbon Tetrachloride | 0.88 | Not Detected | 5.5 | Not Detected |
| 2,2,4-Trimethylpentane | 0.88 | Not Detected | 4.1 | Not Detected |
| Benzene | 0.88 | Not Detected | 2.8 | Not Detected |
| 1,2-Dichloroethane | 0.88 | Not Detected | 3.5 | Not Detected |
| Heptane | 0.88 | Not Detected | 3.6 | Not Detected |
| Trichloroethene | 0.88 | Not Detected | 4.7 | Not Detected |
| 1,2-Dichloropropane | 0.88 | Not Detected | 4.0 | Not Detected |
| 1,4-Dioxane | 3.5 | Not Detected | 13 | Not Detected |
| Bromodichloromethane | 0.88 | Not Detected | 5.9 | Not Detected |
| cis-1,3-Dichloropropene | 0.88 | Not Detected | 4.0 | Not Detected |
| 4-Methyl-2-pentanone | 0.88 | Not Detected | 3.6 | Not Detected |
| Toluene | 0.88 | Not Detected | 3.3 | Not Detected |
| trans-1,3-Dichloropropene | 0.88 | Not Detected | 4.0 | Not Detected |
| 1,1,2-Trichloroethane | 0.88 | Not Detected | 4.8 | Not Detected |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: Ambient Air 6-1-06 Duplicate**

**Lab ID#: 0606023-02AA**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060417** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.75** | **Date of Analysis: 6/4/06 09:04 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Tetrachloroethene | 0.88 | Not Detected | 5.9 | Not Detected |
| 2-Hexanone | 3.5 | Not Detected | 14 | Not Detected |
| Dibromochloromethane | 0.88 | Not Detected | 7.4 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.88 | Not Detected | 6.7 | Not Detected |
| Chlorobenzene | 0.88 | Not Detected | 4.0 | Not Detected |
| Ethyl Benzene | 0.88 | Not Detected | 3.8 | Not Detected |
| m,p-Xylene | 0.88 | Not Detected | 3.8 | Not Detected |
| o-Xylene | 0.88 | Not Detected | 3.8 | Not Detected |
| Styrene | 0.88 | Not Detected | 3.7 | Not Detected |
| Bromoform | 0.88 | Not Detected | 9.0 | Not Detected |
| Cumene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.88 | Not Detected | 6.0 | Not Detected |
| Propylbenzene | 0.88 | Not Detected | 4.3 | Not Detected |
| 4-Ethyltoluene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,3,5-Trimethylbenzene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,2,4-Trimethylbenzene | 0.88 | Not Detected | 4.3 | Not Detected |
| 1,3-Dichlorobenzene | 0.88 | Not Detected | 5.3 | Not Detected |
| 1,4-Dichlorobenzene | 0.88 | Not Detected | 5.3 | Not Detected |
| alpha-Chlorotoluene | 0.88 | Not Detected | 4.5 | Not Detected |
| 1,2-Dichlorobenzene | 0.88 | Not Detected | 5.3 | Not Detected |
| 1,2,4-Trichlorobenzene | 3.5 | Not Detected | 26 | Not Detected |
| Hexachlorobutadiene | 3.5 | Not Detected | 37 | Not Detected |

**Container Type: 6 Liter Summa Canister**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 85 | 70-130 |
| 1,2-Dichloroethane-d4 | 100 | 70-130 |
| 4-Bromofluorobenzene | 100 | 70-130 |

# @ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: ASV-15**

**Lab ID#: 0606023-03A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060414** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.68** | **Date of Analysis: 6/4/06 07:00 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Freon 12 | 0.84 | Not Detected | 4.2 | Not Detected |
| Freon 114 | 0.84 | Not Detected | 5.9 | Not Detected |
| Chloromethane | 3.4 | Not Detected | 6.9 | Not Detected |
| Vinyl Chloride | 0.84 | Not Detected | 2.1 | Not Detected |
| 1,3-Butadiene | 0.84 | 2.8 | 1.8 | 6.2 |
| Bromomethane | 0.84 | Not Detected | 3.3 | Not Detected |
| Chloroethane | 0.84 | Not Detected | 2.2 | Not Detected |
| Freon 11 | 0.84 | Not Detected | 4.7 | Not Detected |
| Ethanol | 3.4 | 4.9 | 6.3 | 9.3 |
| Freon 113 | 0.84 | Not Detected | 6.4 | Not Detected |
| 1,1-Dichloroethene | 0.84 | Not Detected | 3.3 | Not Detected |
| Acetone | 3.4 | 14 | 8.0 | 34 |
| 2-Propanol | 3.4 | 12 | 8.2 | 30 |
| Carbon Disulfide | 0.84 | Not Detected | 2.6 | Not Detected |
| 3-Chloropropene | 3.4 | Not Detected | 10 | Not Detected |
| Methylene Chloride | 0.84 | Not Detected | 2.9 | Not Detected |
| Methyl tert-butyl ether | 0.84 | Not Detected | 3.0 | Not Detected |
| trans-1,2-Dichloroethene | 0.84 | Not Detected | 3.3 | Not Detected |
| Hexane | 0.84 | 8.0 | 3.0 | 28 |
| 1,1-Dichloroethane | 0.84 | Not Detected | 3.4 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 0.84 | 1.4 | 2.5 | 4.2 |
| cis-1,2-Dichloroethene | 0.84 | Not Detected | 3.3 | Not Detected |
| Tetrahydrofuran | 0.84 | Not Detected | 2.5 | Not Detected |
| Chloroform | 0.84 | Not Detected | 4.1 | Not Detected |
| 1,1,1-Trichloroethane | 0.84 | Not Detected | 4.6 | Not Detected |
| Cyclohexane | 0.84 | Not Detected | 2.9 | Not Detected |
| Carbon Tetrachloride | 0.84 | Not Detected | 5.3 | Not Detected |
| 2,2,4-Trimethylpentane | 0.84 | Not Detected | 3.9 | Not Detected |
| Benzene | 0.84 | Not Detected | 2.7 | Not Detected |
| 1,2-Dichloroethane | 0.84 | Not Detected | 3.4 | Not Detected |
| Heptane | 0.84 | Not Detected | 3.4 | Not Detected |
| Trichloroethene | 0.84 | Not Detected | 4.5 | Not Detected |
| 1,2-Dichloropropane | 0.84 | Not Detected | 3.9 | Not Detected |
| 1,4-Dioxane | 3.4 | Not Detected | 12 | Not Detected |
| Bromodichloromethane | 0.84 | Not Detected | 5.6 | Not Detected |
| cis-1,3-Dichloropropene | 0.84 | Not Detected | 3.8 | Not Detected |
| 4-Methyl-2-pentanone | 0.84 | Not Detected | 3.4 | Not Detected |
| Toluene | 0.84 | 2.3 | 3.2 | 8.6 |
| trans-1,3-Dichloropropene | 0.84 | Not Detected | 3.8 | Not Detected |
| 1,1,2-Trichloroethane | 0.84 | Not Detected | 4.6 | Not Detected |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: ASV-15**

**Lab ID#: 0606023-03A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060414** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.68** | **Date of Analysis: 6/4/06 07:00 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Tetrachloroethene | 0.84 | Not Detected | 5.7 | Not Detected |
| 2-Hexanone | 3.4 | Not Detected | 14 | Not Detected |
| Dibromochloromethane | 0.84 | Not Detected | 7.2 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.84 | Not Detected | 6.4 | Not Detected |
| Chlorobenzene | 0.84 | Not Detected | 3.9 | Not Detected |
| Ethyl Benzene | 0.84 | 2.9 | 3.6 | 13 |
| m,p-Xylene | 0.84 | 18 | 3.6 | 80 |
| o-Xylene | 0.84 | 8.9 | 3.6 | 38 |
| Styrene | 0.84 | Not Detected | 3.6 | Not Detected |
| Bromoform | 0.84 | Not Detected | 8.7 | Not Detected |
| Cumene | 0.84 | Not Detected | 4.1 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.84 | Not Detected | 5.8 | Not Detected |
| Propylbenzene | 0.84 | 1.8 | 4.1 | 9.1 |
| 4-Ethyltoluene | 0.84 | 11 | 4.1 | 52 |
| 1,3,5-Trimethylbenzene | 0.84 | 4.4 | 4.1 | 22 |
| 1,2,4-Trimethylbenzene | 0.84 | 14 | 4.1 | 71 |
| 1,3-Dichlorobenzene | 0.84 | Not Detected | 5.0 | Not Detected |
| 1,4-Dichlorobenzene | 0.84 | Not Detected | 5.0 | Not Detected |
| alpha-Chlorotoluene | 0.84 | Not Detected | 4.3 | Not Detected |
| 1,2-Dichlorobenzene | 0.84 | Not Detected | 5.0 | Not Detected |
| 1,2,4-Trichlorobenzene | 3.4 | Not Detected | 25 | Not Detected |
| Hexachlorobutadiene | 3.4 | Not Detected | 36 | Not Detected |

**Container Type: 6 Liter Summa Canister**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 85 | 70-130 |
| 1,2-Dichloroethane-d4 | 103 | 70-130 |
| 4-Bromofluorobenzene | 100 | 70-130 |

# @ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: ASV-13**

**Lab ID#: 0606023-04A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060415** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.58** | **Date of Analysis: 6/4/06 07:43 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Freon 12 | 0.79 | Not Detected | 3.9 | Not Detected |
| Freon 114 | 0.79 | Not Detected | 5.5 | Not Detected |
| Chloromethane | 3.2 | Not Detected | 6.5 | Not Detected |
| Vinyl Chloride | 0.79 | Not Detected | 2.0 | Not Detected |
| 1,3-Butadiene | 0.79 | Not Detected | 1.7 | Not Detected |
| Bromomethane | 0.79 | Not Detected | 3.1 | Not Detected |
| Chloroethane | 0.79 | Not Detected | 2.1 | Not Detected |
| Freon 11 | 0.79 | Not Detected | 4.4 | Not Detected |
| Ethanol | 3.2 | Not Detected | 6.0 | Not Detected |
| Freon 113 | 0.79 | Not Detected | 6.0 | Not Detected |
| 1,1-Dichloroethene | 0.79 | Not Detected | 3.1 | Not Detected |
| Acetone | 3.2 | Not Detected | 7.5 | Not Detected |
| 2-Propanol | 3.2 | 100 | 7.8 | 250 |
| Carbon Disulfide | 0.79 | Not Detected | 2.5 | Not Detected |
| 3-Chloropropene | 3.2 | Not Detected | 9.9 | Not Detected |
| Methylene Chloride | 0.79 | Not Detected | 2.7 | Not Detected |
| Methyl tert-butyl ether | 0.79 | Not Detected | 2.8 | Not Detected |
| trans-1,2-Dichloroethene | 0.79 | Not Detected | 3.1 | Not Detected |
| Hexane | 0.79 | Not Detected | 2.8 | Not Detected |
| 1,1-Dichloroethane | 0.79 | Not Detected | 3.2 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 0.79 | Not Detected | 2.3 | Not Detected |
| cis-1,2-Dichloroethene | 0.79 | Not Detected | 3.1 | Not Detected |
| Tetrahydrofuran | 0.79 | Not Detected | 2.3 | Not Detected |
| Chloroform | 0.79 | Not Detected | 3.8 | Not Detected |
| 1,1,1-Trichloroethane | 0.79 | Not Detected | 4.3 | Not Detected |
| Cyclohexane | 0.79 | Not Detected | 2.7 | Not Detected |
| Carbon Tetrachloride | 0.79 | Not Detected | 5.0 | Not Detected |
| 2,2,4-Trimethylpentane | 0.79 | Not Detected | 3.7 | Not Detected |
| Benzene | 0.79 | Not Detected | 2.5 | Not Detected |
| 1,2-Dichloroethane | 0.79 | Not Detected | 3.2 | Not Detected |
| Heptane | 0.79 | Not Detected | 3.2 | Not Detected |
| Trichloroethene | 0.79 | Not Detected | 4.2 | Not Detected |
| 1,2-Dichloropropane | 0.79 | Not Detected | 3.6 | Not Detected |
| 1,4-Dioxane | 3.2 | Not Detected | 11 | Not Detected |
| Bromodichloromethane | 0.79 | Not Detected | 5.3 | Not Detected |
| cis-1,3-Dichloropropene | 0.79 | Not Detected | 3.6 | Not Detected |
| 4-Methyl-2-pentanone | 0.79 | Not Detected | 3.2 | Not Detected |
| Toluene | 0.79 | Not Detected | 3.0 | Not Detected |
| trans-1,3-Dichloropropene | 0.79 | Not Detected | 3.6 | Not Detected |
| 1,1,2-Trichloroethane | 0.79 | Not Detected | 4.3 | Not Detected |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: ASV-13**

**Lab ID#: 0606023-04A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060415** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.58** | **Date of Analysis: 6/4/06 07:43 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Tetrachloroethene | 0.79 | Not Detected | 5.4 | Not Detected |
| 2-Hexanone | 3.2 | Not Detected | 13 | Not Detected |
| Dibromochloromethane | 0.79 | Not Detected | 6.7 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.79 | Not Detected | 6.1 | Not Detected |
| Chlorobenzene | 0.79 | Not Detected | 3.6 | Not Detected |
| Ethyl Benzene | 0.79 | Not Detected | 3.4 | Not Detected |
| m,p-Xylene | 0.79 | 2.2 | 3.4 | 9.7 |
| o-Xylene | 0.79 | 1.0 | 3.4 | 4.5 |
| Styrene | 0.79 | Not Detected | 3.4 | Not Detected |
| Bromoform | 0.79 | Not Detected | 8.2 | Not Detected |
| Cumene | 0.79 | Not Detected | 3.9 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.79 | Not Detected | 5.4 | Not Detected |
| Propylbenzene | 0.79 | Not Detected | 3.9 | Not Detected |
| 4-Ethyltoluene | 0.79 | 1.9 | 3.9 | 9.5 |
| 1,3,5-Trimethylbenzene | 0.79 | 0.95 | 3.9 | 4.7 |
| 1,2,4-Trimethylbenzene | 0.79 | 3.6 | 3.9 | 18 |
| 1,3-Dichlorobenzene | 0.79 | Not Detected | 4.8 | Not Detected |
| 1,4-Dichlorobenzene | 0.79 | Not Detected | 4.8 | Not Detected |
| alpha-Chlorotoluene | 0.79 | Not Detected | 4.1 | Not Detected |
| 1,2-Dichlorobenzene | 0.79 | Not Detected | 4.7 | Not Detected |
| 1,2,4-Trichlorobenzene | 3.2 | Not Detected | 23 | Not Detected |
| Hexachlorobutadiene | 3.2 | Not Detected | 34 | Not Detected |

**Container Type: 6 Liter Summa Canister**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 84 | 70-130 |
| 1,2-Dichloroethane-d4 | 102 | 70-130 |
| 4-Bromofluorobenzene | 100 | 70-130 |

# @ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: ASV-13-DUP**

**Lab ID#: 0606023-05A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060416** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.58** | **Date of Analysis: 6/4/06 08:22 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Freon 12 | 0.79 | Not Detected | 3.9 | Not Detected |
| Freon 114 | 0.79 | Not Detected | 5.5 | Not Detected |
| Chloromethane | 3.2 | Not Detected | 6.5 | Not Detected |
| Vinyl Chloride | 0.79 | Not Detected | 2.0 | Not Detected |
| 1,3-Butadiene | 0.79 | Not Detected | 1.7 | Not Detected |
| Bromomethane | 0.79 | Not Detected | 3.1 | Not Detected |
| Chloroethane | 0.79 | Not Detected | 2.1 | Not Detected |
| Freon 11 | 0.79 | Not Detected | 4.4 | Not Detected |
| Ethanol | 3.2 | Not Detected | 6.0 | Not Detected |
| Freon 113 | 0.79 | Not Detected | 6.0 | Not Detected |
| 1,1-Dichloroethene | 0.79 | Not Detected | 3.1 | Not Detected |
| Acetone | 3.2 | Not Detected | 7.5 | Not Detected |
| 2-Propanol | 3.2 | 100 | 7.8 | 250 |
| Carbon Disulfide | 0.79 | Not Detected | 2.5 | Not Detected |
| 3-Chloropropene | 3.2 | Not Detected | 9.9 | Not Detected |
| Methylene Chloride | 0.79 | Not Detected | 2.7 | Not Detected |
| Methyl tert-butyl ether | 0.79 | Not Detected | 2.8 | Not Detected |
| trans-1,2-Dichloroethene | 0.79 | Not Detected | 3.1 | Not Detected |
| Hexane | 0.79 | Not Detected | 2.8 | Not Detected |
| 1,1-Dichloroethane | 0.79 | Not Detected | 3.2 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 0.79 | Not Detected | 2.3 | Not Detected |
| cis-1,2-Dichloroethene | 0.79 | Not Detected | 3.1 | Not Detected |
| Tetrahydrofuran | 0.79 | Not Detected | 2.3 | Not Detected |
| Chloroform | 0.79 | Not Detected | 3.8 | Not Detected |
| 1,1,1-Trichloroethane | 0.79 | Not Detected | 4.3 | Not Detected |
| Cyclohexane | 0.79 | Not Detected | 2.7 | Not Detected |
| Carbon Tetrachloride | 0.79 | Not Detected | 5.0 | Not Detected |
| 2,2,4-Trimethylpentane | 0.79 | Not Detected | 3.7 | Not Detected |
| Benzene | 0.79 | Not Detected | 2.5 | Not Detected |
| 1,2-Dichloroethane | 0.79 | Not Detected | 3.2 | Not Detected |
| Heptane | 0.79 | Not Detected | 3.2 | Not Detected |
| Trichloroethene | 0.79 | Not Detected | 4.2 | Not Detected |
| 1,2-Dichloropropane | 0.79 | Not Detected | 3.6 | Not Detected |
| 1,4-Dioxane | 3.2 | Not Detected | 11 | Not Detected |
| Bromodichloromethane | 0.79 | Not Detected | 5.3 | Not Detected |
| cis-1,3-Dichloropropene | 0.79 | Not Detected | 3.6 | Not Detected |
| 4-Methyl-2-pentanone | 0.79 | Not Detected | 3.2 | Not Detected |
| Toluene | 0.79 | Not Detected | 3.0 | Not Detected |
| trans-1,3-Dichloropropene | 0.79 | Not Detected | 3.6 | Not Detected |
| 1,1,2-Trichloroethane | 0.79 | Not Detected | 4.3 | Not Detected |

**Client Sample ID: ASV-13-DUP**

**Lab ID#: 0606023-05A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060416** | **Date of Collection: 6/1/06** | |
| **Dil. Factor:** | **1.58** | **Date of Analysis: 6/4/06 08:22 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Tetrachloroethene | 0.79 | Not Detected | 5.4 | Not Detected |
| 2-Hexanone | 3.2 | Not Detected | 13 | Not Detected |
| Dibromochloromethane | 0.79 | Not Detected | 6.7 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.79 | Not Detected | 6.1 | Not Detected |
| Chlorobenzene | 0.79 | Not Detected | 3.6 | Not Detected |
| Ethyl Benzene | 0.79 | Not Detected | 3.4 | Not Detected |
| m,p-Xylene | 0.79 | 2.2 | 3.4 | 9.6 |
| o-Xylene | 0.79 | 1.0 | 3.4 | 4.5 |
| Styrene | 0.79 | Not Detected | 3.4 | Not Detected |
| Bromoform | 0.79 | Not Detected | 8.2 | Not Detected |
| Cumene | 0.79 | Not Detected | 3.9 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.79 | Not Detected | 5.4 | Not Detected |
| Propylbenzene | 0.79 | Not Detected | 3.9 | Not Detected |
| 4-Ethyltoluene | 0.79 | 2.0 | 3.9 | 10 |
| 1,3,5-Trimethylbenzene | 0.79 | 0.98 | 3.9 | 4.8 |
| 1,2,4-Trimethylbenzene | 0.79 | 3.8 | 3.9 | 18 |
| 1,3-Dichlorobenzene | 0.79 | Not Detected | 4.8 | Not Detected |
| 1,4-Dichlorobenzene | 0.79 | Not Detected | 4.8 | Not Detected |
| alpha-Chlorotoluene | 0.79 | Not Detected | 4.1 | Not Detected |
| 1,2-Dichlorobenzene | 0.79 | Not Detected | 4.7 | Not Detected |
| 1,2,4-Trichlorobenzene | 3.2 | Not Detected | 23 | Not Detected |
| Hexachlorobutadiene | 3.2 | Not Detected | 34 | Not Detected |

**Container Type: 6 Liter Summa Canister**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 85 | 70-130 |
| 1,2-Dichloroethane-d4 | 101 | 70-130 |
| 4-Bromofluorobenzene | 101 | 70-130 |

**Client Sample ID: Lab Blank**

**Lab ID#: 0606023-06A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060405** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 6/4/06 12:01 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Freon 12 | 0.50 | Not Detected | 2.5 | Not Detected |
| Freon 114 | 0.50 | Not Detected | 3.5 | Not Detected |
| Chloromethane | 2.0 | Not Detected | 4.1 | Not Detected |
| Vinyl Chloride | 0.50 | Not Detected | 1.3 | Not Detected |
| 1,3-Butadiene | 0.50 | Not Detected | 1.1 | Not Detected |
| Bromomethane | 0.50 | Not Detected | 1.9 | Not Detected |
| Chloroethane | 0.50 | Not Detected | 1.3 | Not Detected |
| Freon 11 | 0.50 | Not Detected | 2.8 | Not Detected |
| Ethanol | 2.0 | Not Detected | 3.8 | Not Detected |
| Freon 113 | 0.50 | Not Detected | 3.8 | Not Detected |
| 1,1-Dichloroethene | 0.50 | Not Detected | 2.0 | Not Detected |
| Acetone | 2.0 | Not Detected | 4.8 | Not Detected |
| 2-Propanol | 2.0 | Not Detected | 4.9 | Not Detected |
| Carbon Disulfide | 0.50 | Not Detected | 1.6 | Not Detected |
| 3-Chloropropene | 2.0 | Not Detected | 6.3 | Not Detected |
| Methylene Chloride | 0.50 | Not Detected | 1.7 | Not Detected |
| Methyl tert-butyl ether | 0.50 | Not Detected | 1.8 | Not Detected |
| trans-1,2-Dichloroethene | 0.50 | Not Detected | 2.0 | Not Detected |
| Hexane | 0.50 | Not Detected | 1.8 | Not Detected |
| 1,1-Dichloroethane | 0.50 | Not Detected | 2.0 | Not Detected |
| 2-Butanone (Methyl Ethyl Ketone) | 0.50 | Not Detected | 1.5 | Not Detected |
| cis-1,2-Dichloroethene | 0.50 | Not Detected | 2.0 | Not Detected |
| Tetrahydrofuran | 0.50 | Not Detected | 1.5 | Not Detected |
| Chloroform | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,1,1-Trichloroethane | 0.50 | Not Detected | 2.7 | Not Detected |
| Cyclohexane | 0.50 | Not Detected | 1.7 | Not Detected |
| Carbon Tetrachloride | 0.50 | Not Detected | 3.1 | Not Detected |
| 2,2,4-Trimethylpentane | 0.50 | Not Detected | 2.3 | Not Detected |
| Benzene | 0.50 | Not Detected | 1.6 | Not Detected |
| 1,2-Dichloroethane | 0.50 | Not Detected | 2.0 | Not Detected |
| Heptane | 0.50 | Not Detected | 2.0 | Not Detected |
| Trichloroethene | 0.50 | Not Detected | 2.7 | Not Detected |
| 1,2-Dichloropropane | 0.50 | Not Detected | 2.3 | Not Detected |
| 1,4-Dioxane | 2.0 | Not Detected | 7.2 | Not Detected |
| Bromodichloromethane | 0.50 | Not Detected | 3.4 | Not Detected |
| cis-1,3-Dichloropropene | 0.50 | Not Detected | 2.3 | Not Detected |
| 4-Methyl-2-pentanone | 0.50 | Not Detected | 2.0 | Not Detected |
| Toluene | 0.50 | Not Detected | 1.9 | Not Detected |
| trans-1,3-Dichloropropene | 0.50 | Not Detected | 2.3 | Not Detected |
| 1,1,2-Trichloroethane | 0.50 | Not Detected | 2.7 | Not Detected |

**Client Sample ID: Lab Blank**

**Lab ID#: 0606023-06A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060405** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 6/4/06 12:01 PM** | |

| Compound | Rpt. Limit (ppbv) | Amount (ppbv) | Rpt. Limit (uG/m3) | Amount (uG/m3) |
|---|---|---|---|---|
| Tetrachloroethene | 0.50 | Not Detected | 3.4 | Not Detected |
| 2-Hexanone | 2.0 | Not Detected | 8.2 | Not Detected |
| Dibromochloromethane | 0.50 | Not Detected | 4.2 | Not Detected |
| 1,2-Dibromoethane (EDB) | 0.50 | Not Detected | 3.8 | Not Detected |
| Chlorobenzene | 0.50 | Not Detected | 2.3 | Not Detected |
| Ethyl Benzene | 0.50 | Not Detected | 2.2 | Not Detected |
| m,p-Xylene | 0.50 | Not Detected | 2.2 | Not Detected |
| o-Xylene | 0.50 | Not Detected | 2.2 | Not Detected |
| Styrene | 0.50 | Not Detected | 2.1 | Not Detected |
| Bromoform | 0.50 | Not Detected | 5.2 | Not Detected |
| Cumene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,1,2,2-Tetrachloroethane | 0.50 | Not Detected | 3.4 | Not Detected |
| Propylbenzene | 0.50 | Not Detected | 2.4 | Not Detected |
| 4-Ethyltoluene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,3,5-Trimethylbenzene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,2,4-Trimethylbenzene | 0.50 | Not Detected | 2.4 | Not Detected |
| 1,3-Dichlorobenzene | 0.50 | Not Detected | 3.0 | Not Detected |
| 1,4-Dichlorobenzene | 0.50 | Not Detected | 3.0 | Not Detected |
| alpha-Chlorotoluene | 0.50 | Not Detected | 2.6 | Not Detected |
| 1,2-Dichlorobenzene | 0.50 | Not Detected | 3.0 | Not Detected |
| 1,2,4-Trichlorobenzene | 2.0 | Not Detected | 15 | Not Detected |
| Hexachlorobutadiene | 2.0 | Not Detected | 21 | Not Detected |

**Container Type: NA - Not Applicable**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 86 | 70-130 |
| 1,2-Dichloroethane-d4 | 102 | 70-130 |
| 4-Bromofluorobenzene | 102 | 70-130 |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: CCV**

**Lab ID#: 0606023-07A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060402** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 6/4/06 09:47 AM** | |

| Compound | %Recovery |
|---|---|
| Freon 12 | 112 |
| Freon 114 | 114 |
| Chloromethane | 128 |
| Vinyl Chloride | 105 |
| 1,3-Butadiene | 100 |
| Bromomethane | 114 |
| Chloroethane | 107 |
| Freon 11 | 113 |
| Ethanol | 104 |
| Freon 113 | 108 |
| 1,1-Dichloroethene | 105 |
| Acetone | 96 |
| 2-Propanol | 107 |
| Carbon Disulfide | 101 |
| 3-Chloropropene | 98 |
| Methylene Chloride | 108 |
| Methyl tert-butyl ether | 99 |
| trans-1,2-Dichloroethene | 102 |
| Hexane | 99 |
| 1,1-Dichloroethane | 104 |
| 2-Butanone (Methyl Ethyl Ketone) | 103 |
| cis-1,2-Dichloroethene | 105 |
| Tetrahydrofuran | 112 |
| Chloroform | 114 |
| 1,1,1-Trichloroethane | 107 |
| Cyclohexane | 99 |
| Carbon Tetrachloride | 113 |
| 2,2,4-Trimethylpentane | 102 |
| Benzene | 94 |
| 1,2-Dichloroethane | 114 |
| Heptane | 104 |
| Trichloroethene | 108 |
| 1,2-Dichloropropane | 102 |
| 1,4-Dioxane | 99 |
| Bromodichloromethane | 110 |
| cis-1,3-Dichloropropene | 101 |
| 4-Methyl-2-pentanone | 101 |
| Toluene | 98 |
| trans-1,3-Dichloropropene | 111 |
| 1,1,2-Trichloroethane | 109 |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: CCV**

**Lab ID#: 0606023-07A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060402** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 6/4/06 09:47 AM** | |

| Compound | %Recovery |
|---|---|
| Tetrachloroethene | 112 |
| 2-Hexanone | 108 |
| Dibromochloromethane | 120 |
| 1,2-Dibromoethane (EDB) | 111 |
| Chlorobenzene | 110 |
| Ethyl Benzene | 106 |
| m,p-Xylene | 113 |
| o-Xylene | 105 |
| Styrene | 109 |
| Bromoform | 127 |
| Cumene | 114 |
| 1,1,2,2-Tetrachloroethane | 107 |
| Propylbenzene | 108 |
| 4-Ethyltoluene | 109 |
| 1,3,5-Trimethylbenzene | 106 |
| 1,2,4-Trimethylbenzene | 106 |
| 1,3-Dichlorobenzene | 109 |
| 1,4-Dichlorobenzene | 110 |
| alpha-Chlorotoluene | 109 |
| 1,2-Dichlorobenzene | 110 |
| 1,2,4-Trichlorobenzene | 95 |
| Hexachlorobutadiene | 105 |

**Container Type: NA - Not Applicable**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 92 | 70-130 |
| 1,2-Dichloroethane-d4 | 105 | 70-130 |
| 4-Bromofluorobenzene | 103 | 70-130 |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: LCS**

**Lab ID#: 0606023-08A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060403** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 6/4/06 10:30 AM** | |

| Compound | %Recovery |
|---|---|
| Freon 12 | 104 |
| Freon 114 | 109 |
| Chloromethane | 122 |
| Vinyl Chloride | 98 |
| 1,3-Butadiene | 97 |
| Bromomethane | 112 |
| Chloroethane | 104 |
| Freon 11 | 109 |
| Ethanol | 101 |
| Freon 113 | 103 |
| 1,1-Dichloroethene | 101 |
| Acetone | 93 |
| 2-Propanol | 100 |
| Carbon Disulfide | 103 |
| 3-Chloropropene | 107 |
| Methylene Chloride | 105 |
| Methyl tert-butyl ether | 93 |
| trans-1,2-Dichloroethene | 99 |
| Hexane | 97 |
| 1,1-Dichloroethane | 100 |
| 2-Butanone (Methyl Ethyl Ketone) | 96 |
| cis-1,2-Dichloroethene | 101 |
| Tetrahydrofuran | 102 |
| Chloroform | 109 |
| 1,1,1-Trichloroethane | 101 |
| Cyclohexane | 94 |
| Carbon Tetrachloride | 106 |
| 2,2,4-Trimethylpentane | 108 |
| Benzene | 93 |
| 1,2-Dichloroethane | 111 |
| Heptane | 100 |
| Trichloroethene | 107 |
| 1,2-Dichloropropane | 101 |
| 1,4-Dioxane | 96 |
| Bromodichloromethane | 99 |
| cis-1,3-Dichloropropene | 80 |
| 4-Methyl-2-pentanone | 94 |
| Toluene | 95 |
| trans-1,3-Dichloropropene | 109 |
| 1,1,2-Trichloroethane | 107 |

# AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

**Client Sample ID: LCS**

**Lab ID#: 0606023-08A**

**MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN**

| | | | |
|---|---|---|---|
| **File Name:** | **f060403** | **Date of Collection: NA** | |
| **Dil. Factor:** | **1.00** | **Date of Analysis: 6/4/06 10:30 AM** | |

| Compound | %Recovery |
|---|---|
| Tetrachloroethene | 111 |
| 2-Hexanone | 101 |
| Dibromochloromethane | 109 |
| 1,2-Dibromoethane (EDB) | 108 |
| Chlorobenzene | 107 |
| Ethyl Benzene | 110 |
| m,p-Xylene | 105 |
| o-Xylene | 91 |
| Styrene | 113 |
| Bromoform | 109 |
| Cumene | 118 |
| 1,1,2,2-Tetrachloroethane | 106 |
| Propylbenzene | 114 |
| 4-Ethyltoluene | 111 |
| 1,3,5-Trimethylbenzene | 94 |
| 1,2,4-Trimethylbenzene | 75 |
| 1,3-Dichlorobenzene | 110 |
| 1,4-Dichlorobenzene | 112 |
| alpha-Chlorotoluene | 109 |
| 1,2-Dichlorobenzene | 112 |
| 1,2,4-Trichlorobenzene | 115 |
| Hexachlorobutadiene | 113 |

**Container Type: NA - Not Applicable**

| Surrogates | %Recovery | Method Limits |
|---|---|---|
| Toluene-d8 | 93 | 70-130 |
| 1,2-Dichloroethane-d4 | 104 | 70-130 |
| 4-Bromofluorobenzene | 100 | 70-130 |

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# CHAIN-OF-CUSTODY RECORD



Contact Person: Brian Bjorklund
Company: ERM — Email: brian.bjorklund@erm.com
Address: 1777 Botelho Dr #260 City: Walnut Creek State: CA Zip: 94596
Phone: 925-946-0455 Fax: 925-946-9968
Collected by: (Signature) Chami Yi

**Project Info:**
P.O. #: 0020557.10
Project #: 0020557.10
Project Name: Hookston Station

**Turn Around Time:**
☐ Normal
☒ Rush 24 hr (specify)

Lab Use Only
Pressurized by: BS
Date: 6/2/06
Pressurization Gas: (N) He

| Lab I.D. | Field Sample I.D. (Location) | Can# | Date | Time | Analyses Requested | Canister Pressure/Vacuum: Initial | Final | Receipt | Final (psig) |
|---|---|---|---|---|---|---|---|---|---|
| 01A | ASV-14 | 2266 | 6-1-06 | 0922 | TO-15 VOCs | -23 | -1 | 5.5" Hg | 5.0psig |
| 02A | Ambient Air 6-1-06 | 94303 | 6-1-06 | 0926 | TO-15 VOCs | -23 | -1.5 | 7.0" Hg | |
| 03A | ASV-15 | 12711 | 6-1-06 | 1142 | TO-15 VOCs | -24.5 | -0.5 | 6.0" Hg | |
| 04A | ASV-13 | 9419 | 6-1-06 | 1333 | TO-15 VOCs | -23.5 | -0.5 | 4.5" Hg | |
| 05A | ASV-13-DUP | 1852 | 6-1-06 | 1333 | TO-15 VOCs | -23.5 | -0.5 | 4.5" Hg | |

Relinquished by: (signature) Chami Yi — Date/Time
Received by: (signature) — Date/Time 6/2/06 0830
Relinquished by: (signature) — Date/Time
Received by: (signature) — Date/Time
Relinquished by: (signature) — Date/Time
Received by: (signature) — Date/Time

**Notes:** Used seperate pressure gauge to measure Initial / Final Vacuum — seems to be off by -5 in. Hg from the canister gauges.

Lab Use Only
Shipper Name: Fed Ex — Air Bill #: 7270 2582 0699 — Temp (°C): NA — Condition: good — Customer Seals Intact? Yes / No / (None) — Work Order #: 0606023

Form 228 rev.10

*Appendix C*
*Chemical Oxidation Treatability Study*

# Memorandum

**Environmental Resources Management**

1777 Botelho Drive
Suite 260
Walnut Creek, CA 94596
(925) 946-0455
(925) 946-9968 (fax)

**To:** Project File

**From:** Arun Chemburkar

**Date:** 31 May 2006

**Subject:** Chemical Oxidation Treatability Study for UPRR/Helix, Pleasant Hill, California

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This memorandum is intended to accompany and summarize the 22 December 2003 letter report *Chemical Oxidation Treatability Study for UPRR/Helix, Pleasant Hill, California* produced by ERM's Remediation Technology Center (RTC) in Lawrenceville, New Jersey.

To evaluate the effectiveness of chemical oxidation using permanganate and persulfate in treating site soils, RTC analyzed two composite samples (designated "shallow" and "deep"), in late 2003. Specifically the bench-scale tests evaluated the soil permanganate demand and the amount of persulfate consumed by the samples. A sample of each of the composites was also sent to Severn Trent Laboratories in West Sacramento, California for total organic carbon and volatile organic compound analyses.

The shallow soil composite, collected from depths representative of the A-Zone aquifer, exhibited a "moderate" total permanganate demand (4 to 7 pounds per cubic yard [$lb/yd^3$]). The shallow soil composite consumed only 15 to 17%, (5X and 20X concentrations, respectively), of the initial persulfate concentrations during the 14-day test. This relates to a persulfate demand of 6 to 27 $lb/yd^3$.

The deep soil composite, collected from depths representative of the B-Zone aquifer, exhibited a "low" total permanganate demand, (0.5 to 1 $lb/yd^3$). As with the shallow sample, the deep soil composite consumed only 15 to 17% of the initial persulfate concentrations during the 14-day test. This consumption rate relates to a persulfate demand of 6 to 28 $lb/yd^3$.

Based on the significantly greater amount necessary to treat a given soil volume and the increased cost per pound of persulfate, permanganate is the preferred oxidant for implementing a chemical oxidation remediation for ground water treatment at the site.

**Environmental Resources Management**

250 Phillips Blvd, Suite 280
Ewing New Jersey 08618
609-895-0050
609-895-0111 (fax)

*22 December 2003*

*Reference: 0011397*

Mr. Arun Chemburkar
ERM-West, Inc.
1777 Botelho Drive, Suite 260
Walnut Creek, CA 94596

**Re:** Chemical Oxidation Treatability Study for UPRR/Helix, Pleasant Hill, California

Dear Mr. Chemburkar,

This letter report presents the findings of the recent chemical oxidation treatability study performed on VOC-contaminated soils collected from the Hookston Station Site in Pleasant Hill, California. The study was designed to evaluate the total soil permanganate demand and the amount of persulfate consumed by each of two soil samples.

## *SUPPLY OF SITE SOILS*

Site soil samples arrived at ERM's Remediation Technology Center (RTC) in Lawrenceville, New Jersey on 3 October 2003. Five soil samples arrived in good condition, were logged in, and were designated as follows:

- 08190-01: B-68-17.5-18.5;
- 08190-02: MW-13B-23;
- 08190-03: B-68-53;
- 08190-04: MW-12B-18.5; and
- 08190-05: MW-12B-53.

All samples were stored refrigerated until used.

## *TREATABILITY STUDY*

The study consisted of three phases of work as described in the sections that follow.

***Phase I: Initial Characterization***

The five soil samples were combined into two separate composites, designated as "shallow" and "deep." The shallow composite was made up from B-68-17.5-18.5, MW-13B-23, and MW-12B-18.5. The deep composite was made up from B-68-53 and MW-12B-53.

Each of the composite soils was constructed by adding the individual soils to a large bucket, mixing them together by hand until they appeared homogeneous, and then removing any large debris that was present. A sample from each of the composite soils was submitted to Severn Trent Laboratories (STL) in West Sacramento, California, for Total Organic Carbon (TOC) and VOC analyses. The results of these tests are shown in Table 1.

The VOC concentrations were needed to determine the stoichiometric demand of the chlorinated solvents present in each soil composite for persulfate treatment. Because no VOCs were detected in either composite soil, an "assumed" total VOC concentration of 75 mg/kg was used to calculate the mass of persulfate to add in the Persulfate Soil Consumption Test. The ERM-West project manager discussed and approved this assumed total VOC concentration.

***Phase II: Total Soil Permanganate Demand***

In addition to reacting with many hazardous chemicals, permanganate will react with many organic and inorganic materials naturally present in site soils. If the concentrations of these non-target oxidizable materials are very high, large amounts of oxidant will be required for field treatment, resulting in high full-scale implementation costs. The soil demand test is designed to evaluate the oxidant demand exerted by site soils.

The test was individually performed on each composite soil by adding 25 grams of wet-weight processed soil to each of ten 50-ml centrifuge tubes. Increasing volumes (20 µL to 10 mL) of a stock 5% potassium permanganate solution and distilled water were added to each tube to bring the total liquid volume in each tube to approximately 40 mL. The ten tubes made up a concentration series ranging from 1 to 500 mg of potassium permanganate per tube; each tube in the series contained twice the permanganate concentration of the preceding tube. In addition, a "Control" tube was constructed containing only soil and distilled water. All tubes were incubated at room temperature (approximately 20°C) in the laboratory.

All centrifuge tubes were manually mixed over the 15-day reaction period (18 November to 3 December 2003). At that time, the color of the liquid in each tube was visually determined and recorded. For each composite, the pH and ORP of the tubes which bracketed the tube with the lowest residual concentration of permanganate were also measured and recorded.

Solutions containing residual permanganate were pink to purple in color, while solutions in which the starting mass of permanganate had been essentially depleted were colorless. The actual total soil permanganate demand concentration lies between the tube with highest concentration of exhausted permanganate and the tube with the lowest concentration of residual permanganate. The results of the permanganate demand tests for the composite soils are shown in Table 2.

**Shallow Composite**: The soil permanganate demand is between 1.4 and 2.6 g/kg. Based on comparisons with similar oxidant demand tests, this soil would be considered to exhibit a "moderate" total permanganate demand. This result is consistent with the relatively moderate TOC concentration of the processed soil.

Scaled up, the permanganate demand would theoretically correspond to the need for approximately 4 to 7 pounds of permanganate per cubic yard of soil treated. These calculations were made assuming a soil porosity of 30% and a bulk density of 2,700 lb/yd$^3$.

**Deep Composite**: The soil permanganate demand is between 0.17 and 0.35 g/kg. Based on comparisons with similar oxidant demand tests, this soil would be considered to exhibit a "low" total permanganate demand. This result is consistent with the low TOC concentration of the processed soil.

Scaled up, the permanganate demand would theoretically correspond to the need for approximately 0.5 to 1 pound of permanganate per cubic yard of soil treated. These calculations were made assuming a soil porosity of 30% and a bulk density of 2,700 lb/yd$^3$.

***Phase III: Persulfate Soil Consumption Test***

The test was individually performed on each of the two composites by adding 200 g of wet-weight processed soil to each of three 500-mL centrifuge bottles. The Control bottle then received 300 mL of distilled water, was sealed, and shaken by hand to mix. One reaction bottle then received 3 g of sodium persulfate to achieve an oxidant mass equal to five

times the stoichiometric demand of the "assumed concentration" of contaminants. The second reaction bottle received 12 g of sodium persulfate to achieve a 20 times excess mass of oxidant. Each of these two reaction bottles then received an iron catalyst at 100 mg/Kg. The bottles were then filled with 300 mL of distilled water, capped, and shaken by hand to mix.

The six bottles were placed on a shaker table to mix over the 14-day reaction period (19 November to 3 December 2003). After seven days of treatment (26 November 2003), the bottles were removed from the shaker table, and the slurries were analyzed for pH, ORP, and residual persulfate. The bottles were then returned to the shaker table to complete the reaction period. On Day 14 (03 December 2003), the six bottles were again removed from the shaker table and the slurries were analyzed for pH, ORP, and residual persulfate. Results from this test are shown in Table 3.

**Shallow Composite:** After a 14-day reaction period, residual persulfate was detected in both the 5X and 20X excess reaction samples. The percent loss of the 5X excess reaction sample was 14.94%, and the 20X excess reaction showed a 16.52% loss. On a mass consumed per mass of soil treated basis, the 5X composite exhibited a total demand of approximately 2 grams of persulfate per kilogram of wet-weight soil, while the 20X composite exhibited a total demand of approximately 10 grams per kilogram.

These rates of persulfate loss were deemed to be relatively "low," and indicate that a significant concentration of residual persulfate would be expected to exist in site soils after a contact time of two weeks. The residual persulfate would be available for continued chemical oxidation of such soils and/or provide oxidation potential as the oxidant is diluted and moves down gradient with the groundwater flow.

**Deep Composite:** After a 14-day reaction period, residual persulfate was detected in both the 5X and 20X excess reaction samples. The percent loss of the 5X excess reaction sample was 14.94%, and the 20X excess reaction showed a 17.31% loss. On a mass consumed per mass of soil treated basis, the 5X composite exhibited a total demand of approximately 2 grams of persulfate per kilogram of wet-weight soil, while the 20X composite exhibited a total demand of approximately 10.5 grams per kilogram.

These rates of persulfate loss were deemed to be relatively "low," and indicate that a significant concentration of residual persulfate would be

expected to exist in site soils after a contact time of two weeks. The residual persulfate would be available for continued chemical oxidation of such soils and/or provide oxidation potential as the oxidant is diluted and moves down gradient with the groundwater flow.

***CONCLUSIONS***

The following conclusions can be drawn from the results of this treatability study:

- The "Shallow" soil composite exhibited a total permanganate demand of 1.4 to 2.6 g/kg, a range considered to be "moderate" based on the results of many such tests;
- The "Shallow" soil composite consumed a relatively low percentage of the starting persulfate concentration during the two week test (15 to 17%, respectively, with a 5X and 20X stoichiometric excess). The 5X and 20X composite soils exhibited a total demand of approximately 2 and 10 grams of persulfate per kilogram of wet-weight soil, respectively;
- The "Deep" soil composite exhibited a total permanganate demand of 0.17 to 0.35 g/kg, a range considered to be "low;" and
- The "Deep" soil composite consumed a relatively low percentage of the starting persulfate concentration during the two week test (15 to 17%, respectively, with a 5X and 20X stoichiometric excess). The 5X and 20X composite soils exhibited a total demand of approximately 2 and 10.5 grams of persulfate per kilogram of wet-weight soil, respectively

The representativeness of the soil samples supplied for use in the demand tests should be carefully considered when interpreting the laboratory results. This is especially true when composite, rather than discrete samples are tested. Results from soils not "typical" of those at the site to be treated can result in significant under or over statement of the true soil oxidant demands. Field pilot testing can be used to verify the bench-scale results and to provide data valid for process scale-up.

Since both permanganate and persulfate are successful in oxidizing chloroethenes, the choice between the oxidants typically centers around two key issues: (1) economics of use, and (2) ease of implementation. For economics of use, the total oxidant demand numbers can be compared to provide an initial evaluation of cost-effectiveness. For ease of implementation, permanganate treatment is in general superior to persulfate oxidation because permanganate solutions are chemically stable,

react without the need for catalysts, and the pink to purple color of these solutions is helpful in easily determining whether the oxidant is present or not.

The shallow composite soils exhibited an extrapolated total permanganate demand of 4 to 7 pounds of permanganate per cubic yard of soil treated, while the total persulfate demand ranged from approximately 6 pounds of persulfate per cubic yard at 5X stoichiometry to 27 pounds of persulfate per cubic yard at 20X stoichiometry. Assuming that these demand numbers are accurate, permanganate treatment is cheaper than persulfate treatment on chemical cost per cubic yard of treated soil basis.

The deep composite soils exhibited an extrapolated total permanganate demand of only 0.5 to 1 pound of permanganate per cubic yard of soil treated, while the total persulfate demand ranged from approximately 6 pounds of persulfate per cubic yard at 5X stoichiometry to 28 pounds of persulfate per cubic yard at 20X stoichiometry. Assuming that these demand numbers are accurate, permanganate treatment is cheaper than persulfate treatment on chemical cost per cubic yard of treated soil basis.

In addition to the favorable reagent cost, permanganate treatment is both simpler to implement and more likely to behave in a predictable manner in the field.

Should you have any questions about the study or need additional information, please feel free to contact me at 609-895-0050.

Sincerely,

Richard A. Brown

Richard A. Brown

## Table 1. Initial Characterization Results

**Hookston Station**

***Pleasant Hill, CA***

16-Dec-03

### 1-A. Shallow Composite

| Analyte | Concentration (mg/kg) |
|---|---|
| Total Organic Carbon (TOC) | 1,720 |
| VOCs | ND* |

*Not detected

### 1-B. Deep Composite

| Analyte | Concentration (mg/kg) |
|---|---|
| Total Organic Carbon (TOC) | 455 |
| VOCs | ND* |

*Not detected

**Table 2. Total Soil Permanganate Demand**
**Hookston Station**
***Pleasant Hill, CA***
16-Dec-03

**2-A. Shallow Composite**

| Theoretical Permanganate Load (mg/kg of wet-weight soil) | Actual Permanganate Load (mg/kg of wet-weight soil) | Observed Supernatent Color | Observed ORP (mV) | Observed pH | Permanganate Demand (g/kg of wet weight soil) | Permanganate Demand (lbs/yd$^3$ soil)* |
|---|---|---|---|---|---|---|
| 20,000 | 21,054 | Purple | NA** | NA | < 21 | < 57 |
| 10,000 | 10,523 | Purple | NA | NA | < 11 | < 28 |
| 5,000 | 5,266 | Purple | 659.2 | 7.5 | < 5 | < 14 |
| 2,500 | 2,570 | Pink | 582.5 | 7.9 | < 2.6 | < 6.9 |
| 1,250 | 1,397 | Clear | 534.3 | 8.6 | > 1.4 | > 3.8 |
| 625 | 714 | Clear | NA | NA | > 0.71 | > 1.9 |
| 313 | 351 | Clear | NA | NA | > 0.35 | > 0.95 |
| 156 | 157 | Clear | NA | NA | > 0.16 | > 0.42 |
| 78 | 81 | Clear | NA | NA | > 0.081 | > 0.22 |
| 39 | 52 | Clear | NA | NA | > 0.052 | > 0.14 |

*Assumes a 30% porosity and a soil bulk density of 100 lbs/ft$^3$
**NA = Not Analyzed

**2-B. Deep Composite**

| Theoretical Permanganate Load (mg/kg of wet-weight soil) | Actual Permanganate Load (mg/kg of wet-weight soil) | Observed Supernatent Color | Observed ORP (mV) | Observed pH | Permanganate Demand (g/kg of wet weight soil) | Permanganate Demand (lbs/yd$^3$ soil)* |
|---|---|---|---|---|---|---|
| 20,000 | 20,974 | Purple | NA** | NA | < 21 | < 57 |
| 10,000 | 10,539 | Purple | NA | NA | < 11 | < 28 |
| 5,000 | 5,261 | Purple | NA | NA | < 5 | < 14 |
| 2,500 | 2,583 | Purple | NA | NA | < 2.6 | < 7.0 |
| 1,250 | 1,402 | Purple | 627.5 | 7.9 | < 1.4 | < 3.8 |
| 625 | 695 | Purple | 586.1 | 8.3 | < 0.70 | < 1.9 |
| 313 | 354 | Lt. Pink | 542.3 | 8.5 | < 0.35 | < 0.96 |
| 156 | 165 | Clear | 598.5 | 8.8 | > 0.17 | > 0.45 |
| 78 | 77 | Clear | NA | NA | > 0.077 | > 0.21 |
| 39 | 40 | Clear | NA | NA | > 0.040 | > 0.11 |

*Assumes a 30% porosity and a soil bulk density of 100 lbs/ft$^3$
**NA = Not Analyzed

**Table 3. Persulfate Soil Consumption Test**
**Hookston Station**
***Pleasant Hill, CA***
16-Dec-03

**3-A. "Time = 7 Days" Results**

| Sample | pH | ORP | Initial Oxidant (mg/L) | Residual Oxidant (mg/L) | Percent Loss | Persulfate Demand (g/kg)* | Persulfate Demand ($lb/yd^3$ soil)** |
|---|---|---|---|---|---|---|---|
| Shallow Composite 5X | 7.4 | 602.1 | 10,000 | 8,821 | 11.8 | 1.8 | 4.8 |
| Deep Composite 5X | 7.6 | 611.3 | 10,000 | 8,506 | 14.9 | 2.2 | 6.1 |
| Shallow Composite 20X | 7.2 | 691.7 | 40,000 | 33,392 | 16.5 | 9.9 | 26.8 |
| Deep Composite 20X | 7.0 | 690.4 | 40,000 | 34,337 | 14.2 | 8.5 | 22.9 |

*Wet-weight soil

**Assumes a 30% porosity and a soil bulk density of 100 $lbs/ft^3$

**3-B. "Time = 14 Days" Results**

| Sample | pH | ORP | Initial Oxidant (mg/L) | Residual Oxidant (mg/L) | Percent Loss | Persulfate Demand (g/kg)* | Persulfate Demand ($lb/yd^3$ soil)** |
|---|---|---|---|---|---|---|---|
| Shallow Composite 5X | 7.5 | 613.0 | 10,000 | 8,506 | 14.9 | 2.2 | 6.1 |
| Deep Composite 5X | 7.5 | 642.4 | 10,000 | 8,506 | 14.9 | 2.2 | 6.1 |
| Shallow Composite 20X | 7.2 | 652.1 | 40,000 | 33,392 | 16.5 | 9.9 | 26.8 |
| Deep Composite 20X | 7.0 | 666.9 | 40,000 | 33,077 | 17.3 | 10.4 | 28.0 |

*Wet-weight soil

**Assumes a 30% porosity and a soil bulk density of 100 $lbs/ft^3$